US Army Corps
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Walla Walla District

United States
Environmental Protection Agency
Region 10

DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

McNary Reservoir and Lower Snake River Reservoirs

APPENDIX F
Endangered Species Act Consultation for Anadromous Fish Species

FINAL
July 2002

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13. ABSTRACT *(Maximum 200 words)*
This final Dredged Material Management Plan/Environmental Impact Statement (DMMP/EIS) presents the Corps of Engineers' programmatic plan for maintenance of the authorized navigation channel and certain publicly owned facilities in the lower Snake River reservoirs between Lewiston, Idaho and the Columbia River, and McNary reservoir on the Columbia River for 20 years; for management of dredged material from these reservoirs; and for maintenance of flow conveyance capacity at the most upstream extent of the Lower Granite reservoir for the remaining economic life of the dam and reservoir project (to year 2074). The Corps, along with the U.S. Environmental Protection Agency, analyzed four alternatives for this Final DMMP/EIS: Alternative 1 - No Action (No Change) - Maintenance Dredging With In-Water Disposal; Alternative 2 - Maintenance Dredging With In-Water Disposal to Create Fish Habitat and a 3-Foot Levee Raise; Alternative 3 - Maintenance Dredging With Upland Disposal and a 3-Foot Levee Raise; and Alternative 4 - Maintenance Dredging With Beneficial Use of Dredged Material and a 3-Foot Levee Raise (Recommended Plan/Preferred Alternative).

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DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

MCNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

APPENDIX F

ENDANGERED SPECIES ACT CONSULTATION FOR ANADROMOUS FISH SPECIES

prepared by:

U.S. Army Corps of Engineers
Walla Walla District
Walla Walla, WA 99362

July 2002

AQM03-06-1258

1.0 GENERAL

This appendix presents the Endangered Species Act consultation documents for anadromous fish species that might be affected by implementation of the Dredged Material Management Plan. These documents include the Biological Assessment (BA), and the addendums prepared by the Walla Walla District Corps of Engineers (Corps), as well as the Biological Opinion (BO) issued by the National Marine Fisheries Service (NMFS).

The Corps prepared a BA that addressed the impacts on listed species of both the 20-year plan and the proposed dredging and dredged material disposal activity during the winter of 2002-2003. The Corps also prepared two addendums to the original BA that addressed changes to the proposed dredging and disposal sites for the 2002-2003 dredging activity. The Corps determined that the proposed 20-year plan and 2002-2003 dredging activity "*may affect, but are not likely to adversely affect*" individuals of Snake River sockeye salmon; and "*may affect, and are likely to adversely affect*" Snake River fall chinook salmon, Snake River spring/summer chinook salmon, Upper Columbia River spring-run chinook salmon, Snake River basin steelhead, Middle Columbia River steelhead, and Upper Columbia River steelhead.

In response to the Corps' request for formal consultation, the NMFS prepared a BO in July 2002. NMFS' BO stated that, based on implementation of a series of Reasonable and Prudent Measures, the Recommended Plan would not cause jeopardy to, or adversely modify the Critical Habitat of anadromous fish species listed under the ESA. Specific, non-discretionary Terms and Conditions that the Corps will comply with to implement the Reasonable and Prudent Measures are presented in the BO. In addition, a series of discretionary Conservation Recommendations to avoid adverse effects on listed species are presented in the BO. The Corps intends to comply with these recommendations to the extent practicable, and report to NMFS on their implementation, as requested in the BO.

2.0 ORGANIZATION OF DOCUMENTS

The documents in this appendix are organized with the Biological Opinion from NMFS presented first, followed by the addendums and the BA. The BA and addendums are arranged with Addendum B presented first, followed by Addendum A and the BA.

3.0 ERRATA

Figure F-1 of the BA - Disposal Site Selection Decision Tree
Insert the following note on the figure:
For an emergency dredging situation, the Corps would perform environmental coordination on an expedited basis. The Corps would perform as much coordination as possible before initiating the emergency dredging, but some coordination may be performed during the dredging or after the dredging is completed. The Corps would use this decision tree to the extent possible to determine where to dispose of the dredged material in an emergency dredging situation.

Plate F-1 of the BA - Lower Granite Reservoir In-Water Disposal Areas
Insert the following note in the legend:
The dark blue fan-shaped lines on the disposal sites depict the slope of the fill material.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administratio
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

July 27, 2002

Lieutenant Colonel Richard P. Wagenaar
District Engineer
Department of the Army
Corp Of Engineers
Walla Walla District
201 North Third Avenue
Walla, Walla, Washington 99362-1876

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Dredged Material Management Plan for the McNary Reservoir and Lower Snake River Reservoirs (NMFS No. WSB-01-301).

Dear Colonel Wagenaar:

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*) and the Magnuson Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits the National Marine Fisheries Service's (National Oceanic and Atmospheric Administration (NOAA) Fisheries) Biological Opinion (BO) and MSA consultation on the implementation of the Dredged Material Management Plan for the McNary Reservoir and Lower Snake River Reservoirs. The Army Corps of Engineers (COE) determined that the proposed action was likely to adversely affect the ESA listed Evolutionarily Significant Units (ESUs) of endangered Snake River (SR) sockeye (*Oncorhynchus nerka*), threatened Snake River fall (SRF) chinook (*O. tshawytscha*), threatened Snake River spring/summer run (SRSS) chinook (*O. tshawytscha*), threatened Snake River Basin (SR) steelhead (*O. mykiss*), endangered upper Columbia River spring-run (UCRS) chinook (*O. tshawytscha*), endangered upper Columbia River (UCR) steelhead (*O. mykiss*), and threatened middle Columbia River (MCR) steelhead (*O. mykiss*).

This BO reflects the results of a formal ESA consultation and contains an analysis of effects covering the ESUs listed above in the Columbia and Snake Rivers. The BO is based on information provided in the Biological Assessment (BA) and associated addenda sent to NMFS by the COE, and additional information transmitted via telephone conversations, fax, and e-mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office.

The NOAA Fisheries concludes that implementation of the proposed project is not likely to jeopardize the continued existence of the previously noted ESUs or result in destruction or adverse modification of designated Critical Habitat. In your review, please note that the incidental take statement, which includes Reasonable and Prudent Measures and Terms and Conditions, were designed to minimize take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook and coho salmon. The Reasonable and Prudent Measures of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects resulting from the proposed COE actions. Therefore, NOAA Fisheries recommends that they be adopted as EFH conservation measures.

If you have any questions, please contact Mr. Dale Bambrick of the Washington Habitat Branch, Ellensburg Field Office at (509) 962-8911.

Sincerely,

Michael R Crouse

For D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation

Biological Opinion

And

Magnuson-Stevens Fishery Conservation and Management Act

Essential Fish Habitat Consultation

On the Dredged Material Management Plan for the McNary Reservoir and Lower Snake River Reservoirs
WSB-01-301

Action Agency: Department of the Army, Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Issued by: Michael R Crouse
For D. Robert Lohn
Regional Administrator

Date Issued: 7/30/02

TABLE OF CONTENTS

1.0 INTRODUCTION

This document is the product of an Endangered Species Act (ESA) Section 7 formal consultation and a Magnuson-Stevens Fishery Conservation and Management Act (MSA) Essential Fish Habitat (EFH) consultation between the National Marine Fisheries Service (National Oceanic and Atmospheric Administration (NOAA) Fisheries) and the Army Corps of Engineers (COE). The subject of these consultations is the COE's proposed implementation of a dredge materials management plan (DMMP) within an action area including reservoirs of the Lower Snake River (SR) (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs) and the Columbia River (CR) (McNary Reservoir).

The action area encompasses portions of the habitat occupied by the ESA listed Evolutionarily Significant Units (ESUs) of endangered SR sockeye (*Oncorhynchus nerka*), threatened Snake River fall (SRF) chinook (*O. tshawytscha*), threatened Snake River spring/summer run (SRSS) chinook (*O. tshawytscha*), threatened Snake River Basin (SRB) steelhead (*O. mykiss*), endangered upper Columbia River spring-run (UCRS) chinook (*O. tshawytscha*), endangered Upper Columbia River (UCR) steelhead (*O. mykiss*), and threatened Middle Columbia River (MCR) steelhead (*O. mykiss*). This document analyzes the anticipated biological effects of navigation and maintenance dredging, disposal of associated dredged material, and raising the elevation of existing levees near the cities of Lewiston and Clarkston.

1.1 Background Information

Maintenance of the navigation channel, associated port facilities, and water based recreation facilities in the action area requires nearly chronic dredging. The DMMP represents an attempt on the part of the COE to describe not only dredging proposed for 2002 and 2003, but to anticipate the nature, intensity and magnitude of such work that will likely be required over the next 20 years. Significantly, the DMMP also proposes an assessment of the potential use of dredge spoils to improve habitat for listed fish, primarily SRF chinook.

1.2 Consultation History

The COE originally requested informal consultation on the DMMP on September 26, 2000. In their consultation request, the COE presented an effect determination of *may affect, not likely to adversely affect*. The NOAA Fisheries did not concur with the effect determination and indicated that formal consultation (*may affect, likely to adversely affect*) would be appropriate given the scope of the proposal and the potential impacts to listed species. The COE subsequently requested formal consultation on June 27, 2001. Formal consultation was initiated on September 27, 2001, and COE and NOAA Fisheries continued to meet in person and by phone throughout the fall and early winter. During the course of these discussions, the COE requested receipt of a Draft Biological Opinion (DBO) by the end of January, 2002. NOAA Fisheries provided a DBO to the COE on February 1, 2002.

Subsequent meetings and conversations between the COE and NOAA Fisheries helped refine the draft and led to modifications to the action originally proposed. At a meeting on April 22, 2002, the COE informed NOAA Fisheries that it was considering the possibility of adding an additional dredge spoil disposal location and substantially modifying the manner of disposal. Previous proposals had featured the potential beneficial use of dredge spoils to enhance riparian conditions by adding spoils to the river bank. The new proposal would entail creating a shelf with the river to support riparian vegetation at a site (Chief Timothy Habitat Management Unit) not described in the COE DMMP Biological Assessment (BA). On May 30, 2002, NOAA Fisheries received an addendum (COE, 2000) which formally proposed adding these changes to the proposed action. Henceforth, the BA and the 30 May addendum will be collectively noted as the BA.

The objective of this consultation is to determine whether the DMMP, and subsequent DMMP operations, are likely to jeopardize the continued existence of the aforementioned listed ESUs, or result in the destruction or adverse modification of their designated Critical Habitat.

The formal consultation process involved reviewing information contained in the BA, correspondence and communication between NOAA Fisheries and the COE (numerous phone calls, meetings, and emails), and visiting the project sites. The complete administrative record is available at the NOAA Fisheries Washington State Habitat Branch Office.

1.3 Description of the Proposed Action

A complete description of the proposed DMMP is included in the COE BA. The following paragraphs describe the primary project elements relevant to ESA listed species.

The DMMP consists of two major elements: (1) DMMP operations scheduled for 2002-2003 and (2) a 20 year conceptual plan. The DMMP operations scheduled for 2002-2003 encompass maintenance and navigation dredging, dredge material disposal, and monitoring activities. The 20 year conceptual plan includes several studies that will commence prior to dredging operations that are beyond the 2002-2003 schedule. Additionally, the 20 year plan covers levee construction and provides a basic framework for future DMMP activities and ESA consultations.

1.3.1 DMMP Operations for 2002-2003

1.3.1.1 Navigation and Maintenance Dredging

The COE proposes to dredge the navigation system on the lower Snake and Columbia Rivers to attain a minimum depth of 14 feet within the navigation channel. Additionally the COE would dredge areas associated with ports, recreational facilities, and irrigated wildlife habitat management units (HMU). The locations and quantities of materials to be dredged are listed in Table 1.

The majority of the dredging would employ mechanical devices (e.g., clamshell, dragline, backhoe, or a shovel/scoop). However, hydraulic dredging equipment would be used at HMU irrigation intakes and other near shore locations. Hydraulic dredging would be appropriate only where environmental conditions are such that listed fish are not likely to be in the affected area (i.e., water temperatures that exceed 70 degrees Fahrenheit). The efficacy and impacts of the different types of dredging equipment are discussed in Section 2.1.3.

Most dredging would occur during the established in-water work windows (December 15 through March 1 in the Snake and Clearwater Rivers, and December 1 to March 31 in the Columbia River). Some small scale dredging (i.e., boat basins, swim beaches, and irrigation intakes) could occur during the summer and fall in areas where listed fish are expected to be absent if water temperatures exceed 70 degrees Fahrenheit.

Dredging operations in the navigation channel would last between 10 and 24 hours per day, six to seven days per week. Dredging may be staged in multiple shifts as necessary to ensure that dredging operations are completed within the appropriate work windows.

Site to be Dredged	Quantity to be Dredged (cy)
Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	250,500
Port of Clarkston	9,600
Port of Lewiston	5,100
Hells Canyon Resort Marina	3,600
Greenbelt Boat Basin	2,800
Swallows Swim Beach/Boat Basin	16,000
Lower Granite Dam Navigation Lock-Approach	4,000
Lower Monumental Dam Navigation Lock Approach	20,000
Illia Boat Launch	1,400
Willow Landing Boat Launch	6,200
Hollebeke HMU Irrigation Intake	3,300
Total	322,500

Table 1: Sites proposed for dredging during 2002-2003 and the estimated quantities of dredged materials at each site.

1.3.1.2 Dredged Materials Disposal

Potential disposal sites are listed in Table 2. While the COE may choose to dispose material at any of the listed sites, it is anticipated that most material dredged during the 2002 -2003 work window would be disposed at the Chief Timothy HMU site rather than the Knoxway Canyon site as originally proposed. At Chief Timothy, the COE proposes to contour dredged material to create a "riparian bench" within the SR and cover existing silty substrates riverward of the bench with a one to eight foot deep mantle of sand. Cobbles, dredged from navigation lock approaches, would be arrayed in a band (one foot thick and 30 feet wide) around the bench to prevent erosion The surface of the bench would be under two feet of water at maximum pool elevation (738 feet mean sea level.). Approximately 18 acres of the bench would encroach below minimum operating pool elevation (733 feet mean sea level). Accordingly, the proposed disposal would reduce shallow water habitat within the Lower Granite Pool by roughly 18 acres. Sand would also be deposited over approximately 16 acres of silty, shallow (less than 10 feet deep) to mid (10-20 feet deep) depth habitat in an effort to improve SRF chinook rearing habitat quality.

Dredged material would be barged to disposal areas. At in-water disposal sites, final placement would be accomplished either by bottom dumping from hopper barges, dozing from flat deck barges, hydraulic conveying, draglining, or combinations thereof. Regardless of the placement method(s) selected, containment berms - composed of sands, gravels and cobbles - or silt fences would be installed around the disposal area to minimize turbidity to within water quality standards.

Previous testing suggests that sediments within the action area are contaminated with a wide array of pollutants (see Section 1.3.1.3.2). In that concentrations of these pollutants are much higher in silts than in deposits of larger particles, the COE intends to limit the amount of silt placed in-water. In no case, will an in water disposal area receive more than 30 percent silt. More typically, as is proposed at the Chief Timothy HMU site, shallow water habitats will be enhanced by adding sand and the silts will be reserved for capping the riparian bench.

Dredged material containing contaminant concentrations greater than those identified in the Lower CR Dredged Material Evaluation Framework, and silts surplus to the 30 percent maximum in-water disposal criterion above will be disposed upland. The upland sites include the Joso HMU or a licensed disposal facility. The Joso site would feature containment mechanisms (e.g., an impervious liner) to prevent leaching of unsuitable or contaminated materials back into the SR or other sensitive habitat. As barges cannot presently access this site, it is unlikely that it will be available for material disposal during 2002-2003. Heavily contaminated materials, or those that exceed regulatory thresholds for disposal at Joso, will be disposed at licensed disposal facilities.

At both upland and in-water sites, the COE would attempt to beneficially use dredged materials. Dredge spoils may be used to create or enhance fish and wildlife habitat, as fill at the Port of

Wilma or other non-Federal lands, as capping material for the Hanford site, or as road bed material. Some may also be processed to potting soil.

It is anticipated that over the duration of the DMMP the majority of non-contaminated dredged materials would be used for creating or enhancing shallow water habitat for SRF chinook within the action area. Most of the material dredged during the 2002 - 2003 effort would be earmarked for the Chief Timothy HMU site for the combined purposes of enhancing SRF chinook habitat and creating features capable of supporting woody riparian vegetation. Juvenile SRF chinook are often associated with shallow, sandy nearshore areas (Bennet *et al.* 1997). This habitat is thought to be the preferred rearing habitat type within the impounded SR. The COE will use sand obtained through dredging to fill portions of the river and, therefore, mimic the shallow sandy habitat used by rearing SRF chinook. The COE has identified several sites where rearing habitat would be created (Table 2). The sites were identified because they are on the inside of a river bend, have suitable water velocities and underwater contours to facilitate habitat creation, and they enable the placement of dredged material without burying known cultural resource sites.

Site Number	Location (River Mile)	Description of Location	Site Acreage	Site Capacity (Millions of Cubic Yards)
1	113.6-133.4	Chief Timothy Habitat Management Unit	34	0.55
2	119.5-120.5	Kelly Bar/Centennial Island-Left Bank	Completed in 1998	
2	117.5-119.0	Blyton Landing/Yakawawa Canyon-Right Bank	87	5.3
4	115.7-117.0	Knoxway Canyon-Left Bank	44	3.0
5	114.0-115.0	Upriver Granite Point-Right Bank	12	1.4
6	112.5-113.5	Downriver Granite Point-Left Bank	3	1.2
7	110.0-112.0	Wawawai Canyon-Right Bank	51	2.1
8	108.0-109.8	Offield Landing-Left Bank	49	2.6
Total			280	16.1

Table 2. Proposed In-water Disposal Sites within Lower Granite Reservoir for Creation of Shallow Water Rearing Habitat for Juvenile Snake River Fall Chinook Salmon.

1.3.1.3 Monitoring

To minimize negative effects associated with the proposed 2002-2003 DMMP operations, the COE would implement a number of monitoring programs to which dredging operations would be responsive. Monitoring programs would include water quality, sediment contamination, and SRF chinook redd distributions. The data collected from monitoring activities would also be used to guide future dredging operations, minimizing their impact on listed species.

1.3.1.3.1 Water Quality Monitoring

Water quality monitoring for turbidity and ammonia would occur during dredging and disposal operations. Temperature and pH would also be measured concurrent with this monitoring.

Monitoring at dredging sites. The COE would require the dredging contractor to take water samples and measure turbidity using a nephalometer twice per day during active dredging. The contractor would take samples one hour after dredging began and one hour before dredging ended each day. Samples would be taken approximately 300 feet upstream from the dredging operation and roughly 300 feet directly downstream from the point of dredging. The contractor would take two measurements at each location - at roughly 3 feet below the water surface and roughly 3 feet above the river bottom. The contractor would be required to notify the COE within eight hours in the event that the turbidity levels of the dredging operation exceeded allowable levels. These levels are defined as five nephalometric turbidity units (NTUs) over background when the background is 50 NTUs or less, or more than a ten percent increase in turbidity when the background is more than 50 NTUs. Background levels would be measured 300 feet upstream of the dredging operation. Immediately upon determining any exceedence of this NTU limit, the contractor would alter the dredging operation in an attempt to decrease turbidity levels. Monitoring would continue at the downstream location to determine if the NTU levels either returned to an acceptable level or remained high. If the NTU levels do not return to an acceptable level within a time period defined by the Washington Department of Ecology (WDOE), the contractor would stop dredging and wait for the NTU levels to drop below exceedence levels before resuming dredging. If the contractor is unable to meet turbidity requirements, the COE would be contacted for additional instructions.

Ammonia levels would be monitored using techniques similar to those for turbidity monitoring. However, ammonia monitoring would vary in intensity depending on substrate composition. In areas that are expected to be predominately sand, gravel, or cobble (greater than 75 percent by weight), water quality monitors outfitted with ammonia probes and turbidity monitors (as well as other water quality measuring probes) would be positioned about 300 feet upstream and downstream of the dredging operations. In addition, an array of buoys, fitted with monitors would be deployed roughly 650 feet and possibly 1,600 feet downstream. The dredging and disposal activity would be monitored to determine if ammonia levels were exceeded, similar to the turbidity monitoring. If the concentrations of ammonia were found to be high, modification of the dredging operations would occur in a manner similar to those outlined for turbidity.

Additional monitors may need to be installed downstream, however, to determine the persistence of ammonia in the water column and mixing zones. If altering of the dredging or disposal activity were determined to have no effect on lowering the concentration of ammonia, the contractor would cease operations and consult with the COE regarding how to proceed.

In areas with high concentrations of silt, including backwater areas and boat basins, ammonia monitoring would be more intense. Ammonia has a higher potential to bind with silts than with larger substrate particles. Accordingly, operations that mobilize silts pose a greater risk of ammonia exposure to fish than those involving larger particles. For this reason, the COE is proposing an adaptive management approach to monitoring ammonia levels at dredging sites in silty areas, and at in-water dredge material disposal areas.

Ammonia monitoring would also occur at all mechanically dredged backwater areas (e.g., boat basins). Such monitoring would minimally include sampling in four key zones of each individual site. Depending on the site size, one or more monitors would be strategically positioned inside the area to be dredged. The second zone would contain at least one monitor in the opening of the backwater area to determine if ammonia were entering the main river. The third zone would be in the main river downstream of the backwater entrance to determine potential concentrations and dispersal as mixing of water from the mainstem and backwater occurs. The fourth zone would be upstream from the boat basin, and used as a control. If concentrations of ammonia were found to be high, dredging operations would be modified. Such modifications may include slowing dredging operations to reduce total turbidity and ammonia suspension. If modifications were ineffective it would be necessary to isolate the dredging within a physical barrier.

Monitoring for ammonia during hydraulic dredging would be similar to that mentioned for mechanical dredging, but monitoring would not be performed during upland disposal.

Monitoring at disposal sites. Ammonia monitoring will occur in at least three zones at each disposal site in a manner similar to the turbidity monitoring. The first would be approximately 300 feet upstream from the planned disposal site, and the second and third would be within the expected turbidity plume to measure the ammonia concentrations at distances of roughly 300 and 1,000 feet from the release site. If the concentrations of ammonia exceed allowable limits, the contractor would be required to modify the disposal activity. If altering the dredging or disposal activity were determined to be ineffective, the contractor would cease operations and consult with the COE regarding how to proceed.

1.3.1.3.2 Sediment Contaminant Monitoring

The COE has sampled all of the proposed 2002-2003 dredge sites for sediment type and contaminant level. Chemical sampling was conducted on sediments for polynuclear aromatic hydrocarbons (PAHs), organophosphates, chlorinated herbicides, oil, grease, glyphosate, ampa, dioxin, and heavy metals. None of the contaminants were found in concentrations high enough

to require their handling as hazardous waste (COE and EPA 2001). The COE would ensure that any dredging sites added to the list proposed for dredging in 2002-2003 and presented in Appendix N of the Draft DMMP/Environment Impact Statement would be sampled for sediment typing and containment analysis prior to the 2002-2003 dredging schedule.

In addition to the chemicals described above, the COE would also monitor ammonia levels in sediments targeted for dredging. Ammonia is a contaminant of concern because of its toxicity to fish and because it occurs in relatively high concentrations in lower SR silt. According to the COE (2001), sediments that are mobilized during dredging may contain ammonia concentrations that are high enough to negatively affect freshwater fishes. Specifically, the COE evaluated elutriation data, average concentrations of sediment ammonia, and pH within each of the lower SR reservoirs and then performed a risk analysis using these data and the chronic and acute ammonia criterion for fish from the National Criterion for Ammonia in Fresh Water (EPA 1999). The COE determined that potential impacts varied for each reservoir. In the Lower Granite Reservoir, the potential risk from ammonia exposure was judged to be extremely high because the elutriate ammonia average (3.6 mg/L at 8.5 pH) could exceed the early life stage criterion three-fold and could exceed both acute criterions (2.14 mg/L with salmon present, and 3.20 mg/L with salmon absent). Potential impacts from ammonia in the Little Goose, Lower Monumental, and Ice Harbor reservoirs were judged to be moderate because the elutriate ammonia average could exceed the chronic early life stage criterion.

1.3.1.3.3 Redd Distribution Monitoring

Dredging in the lock approaches of the lower SR dams has the potential to disturb listed SRF chinook redds. Therefore, the COE will survey these areas prior to dredging, using the protocol established by Dauble *et al.* (1995). If a redd is located within the footprint of proposed dredging activities, the COE will either modify the dredging footprint to avoid the redd or postpone dredging to a later date (e.g., after emergence of incubating embryos). Although the COE does not expect redds to be abundant in the lock approaches because of low water velocities, the redd surveys would provide definitive presence/absence data useful for assuring that listed SRF chinook redds would not be adversely affected by dredging.

1.3.2 Twenty-Year Conceptual Plan

The need for dredging operations will continue over the next 20 years. On average, many of the locations described in this consultation require dredging on a two year cycle, however, dredging frequencies are dependent on variable sedimentation rates and may be required more or less often. Dredging may be required in the navigation channel, HMUs, swimming beaches, boat basins, and irrigation intakes. The COE and NOAA Fisheries would consult on these future dredging operations on an annual basis (or as often as necessary). The 20 year conceptual plan, therefore, is a notification that the COE intends to dredge specific areas in the future but the COE will not commence the future dredging until consulting with NOAA Fisheries on specific dredging project elements.

The 20-year Conceptual Plan also includes anticipated work elements that are the subject of this consultation. Among these are: raising the levee system in the Lewiston/Clarkston area, continuing studies of rearing habitat created by dredged material disposal, studying the use of backwater dredging areas as salmonid rearing habitat, studying sediment deposition in the action area, and emergency dredging.

1.3.2.1 Levee Raise

To increase the flood protection level for the cities of Lewiston, Idaho, and Clarkston, Washington the COE proposes to raise portions of the local levees by as much as three feet. The subject levees are sufficient to protect for up to a modeled 100 year flood. Post treatment, they would protect roughly up to a modeled 400 year flood. The top of the existing levee would be excavated to the impervious core and filter to allow the new impervious gravel backfill to tie to the existing core and filter. A twelve foot wide top width would be provided for access and maintenance and to rebuild displaced recreational paths. The levee raise would also involve raising Highway 129 and the SR Road upstream of Asotin.

1.3.2.2 Rearing Habitat Studies

The COE has funded a number of studies to determine the efficacy of in-water dredged material disposal as a method of creating or enhancing SRF chinook rearing habitat. The COE would continue evaluating the efficacy of these efforts over the life of the DMMP. This analysis would focus on abundance and distribution relationships between juvenile SRF chinook and proposed disposal sites, particularly in disposal areas where listed SRF chinook are currently not rearing or are otherwise not abundant (i.e., low velocity areas immediately above Lower Granite dam). Recognizing that there are inherent differences in the physical and biological characteristics of each disposal site, the goal of the studies would be to determine whether in-water disposal is effective for creating rearing habitat. The COE intends to create habitats across a range of shallow and mid water depths. If disposal techniques do not appear to improve rearing conditions for SRF chinook, the COE would modify their disposal methods. If subsequent modifications are also ineffective, they may have to dispose all future dredged materials upland.

1.3.2.3 Backwater Rearing Areas Studies

The COE has determined that a number of backwater sites (Joso barge slip, boat basins, swim beaches, etc.) would be dredged over the next 20 years. Research by Zimmerman and Rasmussen (1981) and Easterbrooks (e.g., 1995) has demonstrated that juvenile chinook salmon rear in off-channel areas where the water depth is shallow and the current velocity is very slow (Casey Ponds). This type of habitat, referred to here as backwater, may be important for rearing in regions of the lower SR reservoirs and McNary Pool. The COE would study backwater areas targeted for dredging to determine the spatial and temporal extent of salmonid use. They would also attempt to identify those habitat attributes to which salmonids may be tuned. The study results would be used to guide future dredging operations.

1.3.2.4 Emergency Dredging

The COE anticipates that emergency dredging may be needed over the span of the DMMP. The scope of such dredging cannot be fully anticipated, and, therefore, emergency operations are beyond the scope of this consultation. If emergency dredging is necessary, the COE would notify NOAA Fisheries as soon as possible to begin the consultation process (consultation may occur after completion of the emergency project). However, in situations involving acts of God, disasters, casualties, potential loss of human life, national defense or security emergencies, the COE should not delay response actions to coordinate with NOAA Fisheries.

2.0 ENDANGERED SPECIES ACT

2.1 Biological Opinion

The Objective of this Biological Opinion (BO) is to determine whether the proposed project is likely to jeopardize the continued existence of UCR chinook, UCR steelhead, SRF chinoook, SRSS chinook, SR sockeye, SR steelhead, MCR steelhead, or result in the destruction or adverse modification of designated Critical Habitat for SRF chinook, SRSS chinook, or SR sockeye.

2.1.1 Status of Species and Critical Habitat

The listing status, biological information, and Critical Habitat elements or potential Critical Habitat for the indicated species are described in Table 3.

Species	**Listing Status Reference**	**Critical Habitat Reference**	**Biological Information**
Snake River (SR) sockeye *(O. nerka)*	Endangered Species, (56 Fed. Reg. 58619, November 20, 1991)	Designated Critical Habitat, (58 Fed. Reg. 68543, December 28, 1993)	Status Review for Snake River Sockeye Salmon (Waples and Johnson 1991)
Snake River fall-run (SRF) chinook (*O. tshawytscha*)	Threatened Species, (57 Fed. Reg. 14653, April 22, 1992). See correction: (57 Fed. Reg. 23458, June 3, 1992)	Designated Critical Habitat, (58 Fed. Reg. 68543, December 28, 1993)	Status Review for Snake River Fall Chinook Salmon (Waples *et al.* 1991)

Snake River spring/summer-run (SRSS) chinook (*O. tshawytscha*)	Threatened Species, (57 Fed. Reg. 14653, April 22, 1992). See correction:(57 Fed. Reg. 23458, June 3 1992)	Designated Critical Habitat,(58 Fed. Reg. 68543, December 28, 1993). See update: (64 Fed. Reg. 57399, October 25, 1999)	Status Review for Snake River Spring and Summer Run Chinook Salmon (Matthews and Waples 1991)
Snake River Basin (SRB) steelhead (*O. mykiss*)	Threatened Species, August 18, 1997 (62 Fed. Reg. 43937)	No Designated Critical Habitat	Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California, (Busby *et al.*, 1996)
Upper Columbia River (UCR) steelhead (*O. mykiss*)	Endangered Species, August 18, 1997 (62 Fed. Reg. 43937)	No Designated Critical Habitat	Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California, (Busby *et al.*, 1996)
Upper Columbia River spring-run (UCRS) chinook (*O. tshawytscha*)	Endangered Species, March 24, 1999 (64 Fed. Reg. 14308)	No Designated Critical Habitat	Status Review of Chinook Salmon from Washington, Idaho, Oregon and California, (Myers *et al.*, 1998)
Middle Columbia River (MCR) steelhead (*O. mykiss*)	Threatened Species, March 25, 1999 (64 Fed. Reg. 14517)	No Designated Critical Habitat	Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California, (Busby *et al.*, 1996)

Table 3. References to Federal Register Notices and Status Reviews Containing Additional Information Concerning Listing status, Biological Information, and Critical Habitat Designations for Listed Species Considered in this BO.

The proposed actions would occur within the designated Critical Habitat of endangered SR sockeye, threatened SRF chinook, and threatened SRSS chinook. Essential features of this Critical Habitat include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (58 Fed. Reg. 68543, December 28, 1993).

The information presented below summarizes the status of species and ESUs that are the subject of this consultation. Much of the information, particularly concerning SR species, has been taken directly from the FCRPS BO (NMFS 2000)

2.1.1.1 Snake River Sockeye

The SR sockeye salmon ESU, listed as endangered on November 20, 1991 (56 Fed. Reg. 58619), includes populations of sockeye salmon from the SRB, Idaho (extant populations occur only in the Salmon River subbasin). Under NOAA Fisheries' interim policy on artificial propagation (58 Fed. Reg. 17573), the progeny of fish from a listed population that are propagated artificially are considered part of the listed species and are protected under ESA. Thus, although not specifically designated in the 1991 listing, SR sockeye salmon produced in the captive broodstock program are included in the listed ESU. Given the dire status of the wild population under any criteria (16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000), NOAA Fisheries considers the captive broodstock and its progeny essential for recovery. Critical habitat was designated for SR sockeye salmon on December 28, 1993 (58 Fed. Reg. 68543).

The only remaining sockeye in the SR system are found in Redfish Lake, on the Salmon River. The nonanadromous form (kokanee), found in Redfish Lake and elsewhere in the SRB, is included in the ESU. SR sockeye occur within the action area only during their smolt and adult migrations.

2.1.1.2 Snake River Fall Chinook

The SRF chinook salmon ESU, listed as threatened on April 22, 1992 (57 Fed. Reg. 14653), includes all natural-origin populations of fall chinook in the mainstem SR and several tributaries including the Tucannon, Grande Ronde, Salmon, and Clearwater rivers. Fall chinook from the Lyons Ferry Hatchery are included in the ESU but are not listed. Critical habitat was designated for SRF chinook salmon on December 28, 1993 (58 Fed. Reg. 68543).

This ESU includes the mainstem river and all tributaries, from their confluence with the Columbia River to the Hells Canyon complex. Because genetic analyses indicate that fall-run chinook salmon in the SR are distinct from the spring/summer-run in the Snake basin (Waples *et al.* 1991), SRF chinook salmon are considered separately from the other two forms. They are also considered separately from the UCR summer- and fall-run ESU because of considerable differences in habitat characteristics and adult ocean distribution and less definitive, but still significant, genetic differences.

While most SRF Chinook spawn above the area targeted for dredging, some have been documented spawning within it, particularly near lock approaches. SRF fall chinook are heavily reliant on the action area for rearing and pass through it on their way to the ocean. Some SRF chinook appear to exhibit a stream type life history (La Riviere, pers. comm.) and may be in the action area during dredging operations.

2.1.1.3 Snake River Spring/Summer Run Chinook

The SRSS ESU, listed as threatened on April 22, 1992 (57 Fed. Reg. 14653), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon rivers. Some or all of the fish returning to several of the hatchery programs are also listed including those returning to the Tucannon River, Imnaha, and Grande Ronde hatcheries, and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River. Critical habitat was designated for SRSS chinook salmon on December 28, 1993 (58 Fed. Reg. 68543), and was revised on October 25, 1999 (64 Fed. Reg. 57399).

SRSS chinook are not thought to rear in the impounded portions of the SR. They do pass through the action area on their adult and smolt migrations.

2.1.1.4 Snake River Steelhead

The SR steelhead ESU, listed as threatened on August 18, 1997 (62 Fed. Reg. 43937), includes all natural-origin populations of steelhead in the SRB of southeast Washington, northeast Oregon, and Idaho. None of the hatchery stocks in the SRB is listed, but several are included in the ESU. Critical habitat is not presently designated for SR steelhead.

Steelhead spawning habitat in the SR is distinctive in having large areas of open, low-relief streams at high elevations. In many SR tributaries, spawning occurs at a higher elevation (up to 2,000 m) than for steelhead in any other geographic region. SRB steelhead also migrate farther from the ocean (up to 1,500 km) than most.

SR steelhead are not known to spawn or rear in the impounded reaches of the SR. Adult SR steelhead do hold in the mainstem Snake and Columbia Rivers for extended periods (months) prior to spawning. Adult SR steelhead are likely to be in the action area during the proposed work window.

2.1.1.5 UCRS Chinook

UCRS salmon ESU, listed as endangered on March 24, 1999 (64 Fed. Reg. 14308), includes all natural-origin, stream-type chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River basins. All chinook in the Okanogan River are apparently ocean-type and are considered part of the UCR summer- and fall-run ESU. The spring-run components of the following hatchery stocks are also listed: Chiwawa, Methow, Twisp, Chewuch, and White rivers and Nason Creek. Critical habitat is not presently designated for UCRS chinook.

UCRS chinook spawn and rear well upstream of the McNary pool, and are very unlikely to be near the action area during dredging and disposal operations. They are not believed to rely on any portion of the action area for their rearing requirements.

2.1.1.6 UCR Steelhead

The UCR steelhead ESU, listed as endangered on August 18, 1997 (62 Fed. Reg. 43937), includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River, Washington, to the U.S./Canada border. The Wells Hatchery stock is included among the listed populations. Critical habitat is not presently designated for UCR steelhead.

UCR steelhead spawn and rear well upstream of the McNary pool, and are very unlikely to be near the action area during dredging and disposal operations. They are not believed to rely on any portion of the action area for their rearing requirements.

2.1.1.7 Mid-Columbia River Steelhead

MCR steelhead ESU, listed as threatened on March 25, 1999 (64 Fed. Reg. 14517), includes all natural-origin populations in the CR basin above the Wind River, Washington, and the Hood River, Oregon, including the Yakima River, Washington. This ESU includes the only populations of winter inland steelhead in the United States (in the Klickitat River, Washington, and Fifteenmile Creek, Oregon). Both the Deschutes River and Umatilla River hatchery stocks are included in the ESU, but are not listed. Critical habitat is not presently designated for MCR steelhead.

Hatchery management practices are suspected to be a major factor in the decline of this ESU. The genetic contribution of non-indigenous, hatchery stocks may have reduced the fitness of the locally adapted, native fish. A decrease in fitness could have occurred through hybridization and associated reductions in genetic variation or introduction of deleterious (non-adapted) genes. Hatchery fish can also directly displace natural spawning populations, compete for food resources, or engage in agonistic interactions (Campton and Johnston 1985; Waples 1991; Hilborn 1992; NMFS 1996; 63 Fed. Reg. 11798, March 10, 1998).

The Yakima and Walla Walla River populations of MCR steelhead are potentially affected by the proposed action. However, both populations spawn and rear well upstream of the McNary pool, and are very unlikely to be near the action area during dredging and disposal operations. They are not believed to rely on any portion of the action area for their rearing requirements.

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consulting regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to adversely modify Critical Habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

NOAA Fisheries then evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making the determination, NOAA Fisheries must consider the estimated level of mortality attributable to (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life history stages that may occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

Furthermore, NOAA Fisheries evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated Critical Habitat. The NOAA Fisheries must determine whether habitat modifications appreciably diminish the value of Critical Habitat for both the survival and recovery of the listed species. The NOAA Fisheries identifies those effects of the action that impair the function of any essential element of Critical Habitat. The NOAA Fisheries then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NOAA Fisheries concludes that the action will adversely modify Critical Habitat, it must identify any reasonable and prudent alternatives available.

Guidance for making determinations of jeopardy and adverse modification of Critical Habitat are contained in NOAA Fisheries' document: *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids*, August 1999 (available online at: www.nwr.noaa.gov/1habcon/habweb/pubs/newjeop9.pdf).

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. The NOAA Fisheries' Critical Habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration and spawning of the listed salmon under the existing environmental baseline.

2.1.2.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA Section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. The NOAA Fisheries also considers the current status of the listed species; taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its original decision to list the species for protection under the ESA. Additionally, the assessment will consider any new information or data that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time, protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have the following attributes: population sizes large enough to maintain genetic diversity and heterogeneity, the

ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment

SR sockeye, SRF chinook, SRSS chinook, SR steelhead, UCRS chinook, UCR steelhead, and MCR steelhead have similar basic biological requirements. These requirements include food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (adapted from Spence *et al.* 1996).

NOAA Fisheries has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI); available online at: www.nwr.noaa.gov/1habcon/habweb/pubs/matrix.pdf). These pathways (water quality, habitat access, habitat elements, channel condition and dynamics, flow/hydrology, watershed conditions, disturbance history, and riparian reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g., indicators for water quality include temperature, sediment, and chemical contamination.) that are measured or described directly (see: NMFS 1996). Based on the measurement or description, each indicator is classified within a category of the properly functioning condition (PFC) framework: (1) properly functioning, (2) at risk, or (3) not properly functioning. Properly functioning condition is defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

The specific biological requirements to be affected by the proposed include food, water quality, and, potentially, migratory access. Further, the proposed action is likely to affect habitat attributes including water quality, habitat access, habitat elements and channel condition.

2.1.2.2 Factors Affecting the Species at the Population Level

The information in the following section was extracted directly from the BO for the Federal Columbia River Power System (NMFS 2000).

2.1.2.2.1 Snake River Sockeye

Life History. In general, juvenile sockeye salmon rear in the lake environment for 1, 2, or 3 years before migrating to sea. Adults typically return to the natal lake system to spawn after spending 1, 2, 3, or 4 years in the ocean (Gustafson *et al.* 1997).

Habitat and Hydrology. In 1910, impassable Sunbeam Dam was constructed 20 miles downstream of Redfish Lake. Although several fish ladders and a diversion tunnel were installed during subsequent decades, it is unclear whether enough fish passed above the dam to sustain the run. The dam was partly removed in 1934, after which Redfish Lake runs partially rebounded. Evidence is mixed as to whether the restored runs constitute anadromous forms that managed to

persist during the dam years, nonanadromous forms that became migratory, or fish that strayed in from outside the ESU.

Population Trends and Risks. NOAA Fisheries proposed an interim recovery level of 2,000 adult SR sockeye salmon in Redfish Lake and two other lakes in the SRB (Table 1.3-1 in NMFS 1995c). Low numbers of adult SR sockeye salmon preclude a CRI- or QAR-type quantitative analysis of the status of this ESU. However, because only 16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000, NOAA Fisheries considers the status of this ESU to be dire under any criteria. Clearly the risk of extinction is very high.

2.1.2.2.2 Snake River Fall Chinook

Life History. Fall chinook salmon in this ESU are ocean-type. Adults return to the SR at ages 2 through 5, with age 4 most common at spawning (Chapman *et al.* 1991). Spawning, which takes place in late fall, occurs in the mainstem and in the lower parts of major tributaries (NWPPC 1989; Bugert *et al.* 1990). Juvenile fall chinook salmon move seaward slowly as subyearlings, typically within several weeks of emergence (Chapman *et al.* 1991). Based on modeling by the Chinook Technical Committee, the Pacific Salmon Commission estimates that a significant proportion of the SRF chinook (about 36 percent) are taken in Alaska and Canada, indicating a far ranging ocean distribution. In recent years, only 19 percent were caught off Washington, Oregon, and California, with the balance (45 percent) taken in the Columbia River (Simmons 2000).

Some SRF chinook historically migrated over 1,500 km from the ocean. Although the Snake River population is now restricted to habitat in the lower river, genes associated with the lengthier migration may still reside in the population. Because longer freshwater migrations in chinook salmon tend to be associated with more-extensive oceanic migrations (Healey 1983), maintaining populations occupying habitat that is well inland may be important in continuing diversity in the marine ecosystem as well.

Habitat and Hydrology. With hydrosystem development, the most productive areas of the SRB are now inaccessible or inundated. The upper reaches of the mainstem SR were the primary areas used by fall chinook salmon, with only limited spawning activity reported downstream from river kilometer (Rkm) 439. The construction of Brownlee Dam (1958; Rkm 459), Oxbow Dam (1961; Rkm 439), and Hells Canyon Dam (1967; Rkm 397) eliminated the primary production areas of SRF chinook salmon. There are now 12 dams on the mainstem SR, and they have substantially reduced the distribution and abundance of fall chinook salmon (Irving and Bjornn 1981).

Hatchery Influence. The SR has contained hatchery-reared fall chinook salmon since 1981 (Busack 1991). The hatchery contribution to SR escapement has been estimated at greater than 47 percent (Myers *et al.* 1998). Artificial propagation is recent, so cumulative genetic changes associated with it may be limited. Wild fish are incorporated into the brood stock each year, which should reduce divergence from the wild population. Release of subyearling fish may also

help minimize the differences in mortality patterns between hatchery and wild populations that can lead to genetic change (Waples 1999). (See NMFS [1999] for further discussion of the SRF chinook salmon supplementation program.)

Population Trends and Risks. For the SRF chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.86, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the aggregate SRF chinook salmon population, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.40 (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 (McClure *et al.* 2000).

2.1.2.2.3 Snake River Spring/Summer Chinook.

Life History. In the SRSS share key life history traits. Both are stream type fish, with juveniles that migrate swiftly to sea as yearling smolts. Depending primarily on location within the basin (and not on run type), adults tend to return after either 2 or 3 years in the ocean. Both spawn and rear in small, high-elevation streams (Chapman *et al.* 1991), although where the two forms coexist, spring-run chinook spawn earlier and at higher elevations than summer-run chinook.

Habitat and Hydrology. Even before mainstem dams were built, habitat was lost or severely damaged in small tributaries by construction and operation of irrigation dams and diversions, inundation of spawning areas by impoundments, and siltation and pollution from sewage, farming, logging, and mining (Fulton1968). Recently, the construction of hydroelectric and water storage dams without adequate provision for adult and juvenile passage in the upper SR has kept fish from all spawning areas upstream of Hells Canyon Dam.

Hatchery Influence. There is a long history of human efforts to enhance production of chinook salmon in the SRB through supplementation and stock transfers. The evidence is mixed as to whether these efforts have altered the genetic makeup of indigenous populations. Straying rates appear to be very low.

Population Trends and Risks. For the SRSS chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.96 to 0.80, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to the effectiveness of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated median population growth rates and the risk of absolute extinction for the seven spring/summer chinook salmon index stocks, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction

within 100 years for the wild component ranges from zero for Johnson Creek to 0.78 for the Imnaha River (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years ranges from zero for Johnson Creek to 1.00 for the wild component in the Imnaha River (McClure *et al.* 2000).

2.1.2.2.4 Snake River Steelhead

Life History. Fish in this ESU are summer steelhead. They enter freshwater from June to October and spawn during the following March to May. Two groups are identified, based on migration timing, ocean-age, and adult size. A-run steelhead, thought to be predominately age-1-ocean, enter freshwater during June through August. B-run steelhead, thought to be age-2-ocean, enter freshwater during August through October. B-run steelhead typically are 75 to 100 mm longer at the same age. Both groups usually smolt as 2- or 3-year-olds. All steelhead are iteroparous, capable of spawning more than once before death.

Habitat and Hydrology. Hydrosystem projects create substantial habitat blockages in this ESU; the major ones are the Hells Canyon Dam complex (mainstem SR) and Dworshak Dam (North Fork Clearwater River). Minor blockages are common throughout the region. Steelhead spawning areas have been degraded by overgrazing, as well as by historical gold dredging and sedimentation due to poor land management. Habitat in the Snake basin is warmer and drier and often more eroded than elsewhere in the Columbia River basin or in coastal areas.

Hatchery Influence. Hatchery fish are widespread and stray to spawn naturally throughout the region. In the 1990s, an average of 86 percent of adult steelhead passing Lower Granite Dam were of hatchery origin. Hatchery contribution to naturally spawning populations varies, however, across the region. Hatchery fish dominate some stocks, but do not contribute to others.

Population Trends and Risks. For the SR steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.91 to 0.70, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the A- and B-runs, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 for A-run steelhead and 0.93 for B-run fish (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 for both runs (McClure *et al.* 2000).

2.1.2.2.5 UCRS Chinook

Life History. UCRS chinook are considered stream-type fish, with smolts migrating as yearlings. Most stream-type fish mature at 4 years of age. Few coded-wire tags are recovered in ocean fisheries, suggesting that the fish move quickly out of the north central Pacific and do not migrate along the coast.

Habitat and Hydrology. Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River includes dry areas where conditions are less conducive to steelhead survival than in many other parts of the Columbia basin (Mullan *et al.* 1992). Salmon in this ESU must pass up to nine Federal and private dams, and Chief Joseph Dam prevents access to historical spawning grounds farther upstream. Degradation of remaining spawning and rearing habitat continues to be a major concern associated with urbanization, irrigation projects, and livestock grazing along riparian corridors. Overall harvest rates are low for this ESU, currently less than 10 percent (ODFW and WDFW 1995).

Hatchery Influence. Spring-run chinook salmon from the Carson National Fish Hatchery (a large composite, nonnative stock) were introduced into and have been released from local hatcheries (Leavenworth, Entiat, and Winthrop National Fish Hatcheries [NFH]). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally spawning populations. In addition to these national production hatcheries, two supplementation hatcheries are operated by the Washington Department of Fish and Wildlife (WDFW) in this ESU. The Methow Fish Hatchery Complex (operations began in 1992) and the Rock Island Fish Hatchery Complex (operations began in 1989) were both designed to implement supplementation programs for naturally spawning populations on the Methow and Wenatchee rivers, respectively (Chapman *et al.* 1995).

Population Trends and Risks. For the UCRS chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.85 to 0.83, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated median population growth rates and the risk of absolute extinction for the three spawning populations identified by Ford *et al.* (1999), using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from 0.97 for the Methow River to 1.00 for the Wenatchee and Entiat rivers (Table B-5 in McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of extinction within 100 years is 1.00 for all three spawning populations (McClure et al. 2000).

NOAA Fisheries has also used population risk assessments for UCR spring chinook salmon and steelhead ESUs from the draft quantitative analysis report (QAR) (QAR; Cooney 2000). Risk assessments described in that report were based on Monte Carlo simulations with simple

spawner/spawner models that incorporate estimated smolt carrying capacity. Population dynamics were simulated for three separate spawning populations in the UCR spring chinook salmon ESU, the Wenatchee, Entiat, and Methow populations. The QAR assessments showed extinction risks for UCR spring chinook salmon of 50 percent for the Methow, 98 percent for the Wenatchee, and 99 percent for the Entiat spawning populations. These estimates are based on the assumption that the median return rate for the 1980 brood year to the 1994 brood year series will continue into the future.

2.1.2.2.6 UCR Steelhead

Life History. As is other ESUs (the Snake and mid-Columbia River basins), steelhead in the Upper Columbia River ESU remain in freshwater up to a year before spawning. Smolt age is dominated by two-year-olds. Based on limited data, steelhead from the Wenatchee and Entiat Rivers return to freshwater after one year in salt water, whereas Methow River steelhead are primarily age-two-ocean (Howell *et al.* 1985). Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to seven years, are reported from this ESU. The relationship between anadromous and nonanadromous forms in the geographic area is unclear.

Habitat and Hydrology. The Chief Joseph and Grand Coulee dam construction caused blockages of substantial habitat, as did that of smaller dams on tributary rivers. Habitat issues for this ESU relate mostly to irrigation diversions and hydroelectric dams, as well as to degraded riparian and instream habitat from urbanization and livestock grazing.

Hatchery Influence. Hatchery fish are widespread and escape to spawn naturally throughout the region. Spawning escapement is dominated by hatchery-produced fish.

Population Trends and Risks. For the UCR steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the aggregate UCR steelhead population, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.25 (McClure *et al.* 2000). Assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years is 1.00 (McClure *et al.* 2000).

Because of data limitations, the QAR steelhead assessments in Cooney (2000) were limited to two aggregate spawning groups—the Wenatchee/Entiat composite and the above-Wells populations. Wild production of steelhead above Wells Dam was assumed to be limited to the Methow system. Assuming a relative effectiveness of hatchery spawners of 1.0, the risk of absolute extinction within 100 years for UCR steelhead is 100 percent. The QAR also assumed

hatchery effectiveness values of 0.25 and 0.75. A hatchery effectiveness of 0.25 resulted in projected risks of extinction of 35 percent for the Wenatchee/Entiat and 28 percent for the Methow populations. At a hatchery effectiveness of 0.75, risks of 100 percent were projected for both populations.

2.1.2.2.7 MCR Steelhead

Life History. Most fish in this ESU smolt at 2 years and spend 1 to 2 years in salt water before reentering freshwater, where they may remain up to a year before spawning (Howell *et al.* 1985, BPA 1992). All steelhead upstream of The Dalles Dam are summer-run (Schreck *et al.* 1986, Reisenbichler *et al.* 1992, Chapman *et al.* 1994). The Klickitat River, however, produces both summer and winter steelhead, and age-2-ocean steelhead dominate the summer steelhead, whereas most other rivers in the region produce about equal numbers of both age-1- and 2-ocean fish. A nonanadromous form co-occurs with the anadromous form in this ESU; information suggests that the two forms may not be isolated reproductively, except where barriers are involved.

Habitat and Hydrology. Substantial habitat blockages are present in this ESU. While Pelton Dam on the Deschutes River is one of the more significant, minor blockages occur throughout the region. In the Yakima Basin, Cle Elum, Rimrock, Bumping, Keechelus, and Kachess Dams all Federal water storage dams, have blocked access to many miles of habitat since the early part of the Twentieth century. Water withdrawals and overgrazing have seriously reduced summer flows in the principal summer steelhead spawning and rearing tributaries of the Deschutes River. High summer and low winter temperatures are limiting factors for salmonids in many streams in this region (Bottom *et al.* 1985).

Hatchery Influence. Continued increases in the proportion of stray steelhead in the Deschutes River basin is a major concern. The ODFW and the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) estimate that 60 percent to 80 percent of the naturally spawning population consists of strays, which greatly outnumber naturally produced fish. Although the reproductive success of stray fish has not been evaluated, their numbers are so high that major genetic and ecological effects on natural populations are possible (Busby *et al.* 1999).

The negative effects of any interbreeding between stray and native steelhead will be exacerbated if the stray steelhead originated in geographically distant river basins, especially if the river basins are in different ESUs. The populations of steelhead in the Deschutes River basin include the following:

- Steelhead native to the Deschutes River
- Hatchery steelhead from the Round Butte Hatchery on the Deschutes River
- Wild steelhead strays from other rivers in the CRB
- Hatchery steelhead strays from other CRB streams

Regarding the latter, CTWSRO reports preliminary findings from a tagging study by T. Bjornn and M. Jepson (University of Idaho) and NOAA Fisheries suggesting that a large fraction of the steelhead passing through CR Dams (e.g., John Day and Lower Granite dams) have entered the Deschutes River and then returned to the mainstem Columbia River. A key unresolved question about the large number of strays in the Deschutes basin is how many stray fish remain in the basin and spawn naturally.

Population Trends and Risks. For the MCR steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.88 to 0.75, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for four of the subbasin populations, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from zero for the Yakima River summer run to 1.00 for the Umatilla River and Deschutes River summer runs (McClure *et al.* 2000). Assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100 percent), the risk of absolute extinction within 100 years ranges from zero for the Yakima River summer run to 1.00 for the Deschutes River summer run (McClure *et al.* 2000).

2.1.2.3 Factors Affecting the Species within the Action Area

Section 4(a)(1) of the ESA and NOAA Fisheries listing regulations (50 C.F.R § 424) set forth procedures for listing species. The Secretary of Commerce must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors; (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The proposed action includes activities that would have some level of effects with short-term impacts from category (1) and the potential for long-term impacts from categories (4) and (5). The characterization of these effects and a conclusion relating the effects to the continued existence of the subject species of this consultation are provided in Section 2.1.3.

The lower SR and MCR, the action area for the proposed project, have been substantially modified to the detriment of listed salmonids. The most conspicuous habitat modifications are caused by dams on the these rivers. The dams have transformed portions of the rivers from fully lotic (free flowing) to essentially lentic (standing water) environments. The reduction in absolute water velocity and desynchronization of historical run off patterns has dramatically altered the physical characteristics of both rivers. Additionally, sediment transport and deposition dynamics, water temperature, habitat diversity, and habitat access have been altered to the detriment of listed salmonids as a result of dam construction (Spence *et al.* 1996).

Concurrent with physical changes, indirect biological transformation has also occurred. Exotic species that prey on salmonids, including percids and centrarchids, have become established in the Snake and Columbia Rivers (Wydoski and Whitney 1979). These predators may feed directly on salmonids (Tabor *et al.* 1993) or compete for other food or habitat resources. Other native predators including the pikeminnow (*Ptychocheilus oregonensis)* have exploited the impounded environment created by dams, although their predation rates are higher in the lower Columbia River (Faler *et al.* 1988).

A number of general anthropogenic factors have also influenced listed species. Along the shores of the Snake and Columbia Rivers, agriculture, transportation infrastructure, commercial and residential development have displaced riparian and shallow water habitat used by juvenile salmonids. This development also contributes some quantity of runoff and pollution, which may include sediments, fertilizer, pesticides, and petroleum products. In the lower SR, above Lower Granite Dam, agricultural land use is suspected to be a major cause of sedimentation and ammonia accumulation (COE 2001).

2.1.2.4 Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process " (50 C.F.R.§ 402.02).

The major factors influencing the environmental baseline within the action area include: (1) the presence of hydroelectric dams, (2) the actions carried out under the NOAA Fisheries Federal Columbia River Power System (FCRPS) BO, (3) agricultural water use, and (4) land use and shoreline development.

2.1.2.4.1. Hydroelectric Dams

The mainstem dams on the Lower Snake and Columbia Rivers are the most prominent features that influence the environmental baseline within the action area. Additional mainstem dams above and below the action area also influence the environmental baseline within the action area. These dams have substantially changed the Snake and Columbia Rivers' physical and biological characteristics. They have altered temperature profiles, inundated spawning habitat, created passage barriers, diminished sediment transport, altered seasonal flow patterns, imparted broad diel flow fluctuations, eliminated lotic channel characteristics, and created habitat for species that prey on or compete with salmonids.

In terms of MPI indicators, the dams have caused a broad range of habitat degradation. At the Water Quality pathway, the hydropower dams have contributed to high instream temperatures

and high concentrations (supersaturation) of dissolved atmospheric gases (Spence *et al.* 1996). Portions of the action area have been identified on the State 303(d) list (Clean Water Act) for degraded temperature and total dissolved gas parameters (WSDOE 1998). As a result, the MPI Temperature indicator is *not properly functioning.*

At the Habitat Elements pathway, all indicators are *not properly functioning.* When the Snake and Columbia Rivers were transformed from flowing bodies of water to a series of slow moving reservoirs (NMFS 2000), much of the historic habitat was inundated and habitat functions lost. Sediment transport has been restricted to the extent that fine materials (silt, sand) settle out of the water column in the reservoirs instead of being flushed downstream (causing sedimentation) (NMFS 1996). Additionally, low water velocity and the physical presence of the dams (both upstream and in the action area) traps spawning substrates, preventing downstream recruitment (NMFS 1996). Off-channel habitat, refugia (remnant habitat that buffers populations against extinction), and large woody debris production have been reduced by inundating off-channel areas and historic riparian zones. Because the flow is highly regulated between dams, hydraulic variation is lacking. Consequently, pools, riffles and other instream habitat are greatly reduced or have been eliminated.

At the Habitat Access pathway, the dams within the action area inhibit safe passage of listed salmonids. The dams create conditions where listed salmonids may be killed or injured by mechanical impingement or high dissolved gas levels (NMFS 1996, Spence *et al.* 1996). Additionally, the dams create false attraction to impassable areas, habitat for predators, and otherwise delay the progress of migrants. The direct presence of the dams, as well as secondary problems they cause puts the MPI Physical Barriers Indicator at *not properly functioning* within the action area.

Within the Channel Condition and Dynamics pathway, the Floodplain Connectivity indicator is *not properly functioning.* Dam operations, flow (reservoir) management, and the related inundation of off-channel rearing and floodplain areas have reduced the size and quality of floodplains along the Snake and Columbia Rivers (NMFS 2000).

In terms of the Flow/Hydrology pathway, dams have affected the Change in Peak/Base Flows indicator to the extent that the indicator is *not properly functioning.* Dam operations, by nature, restrict and control the passage of water through river basins. The hydrosystem on the Snake and Columbia Rivers affects the natural hydrograph by decreasing spring and summer flows and increasing fall and winter flows (NMFS 2000).

2.1.2.4.2. Federal Columbia River Power System BO

On December 21, 2000, NOAA Fisheries issued the FCRPS BO (NMFS 2000), finding that the FCRPS jeopardizes the continued existence and survival of endangered SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SR steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead ESUs. To avoid jeopardy, Federal agencies regulating the FCRPS were provided a number of Reasonable and Prudent Alternatives

(RPAs). In the RPAs, NOAA Fisheries identified four categories of actions where survival and recovery of listed salmonids may be enhanced: hydroelectric, habitat, harvest, and hatcheries. It is important to note that a number of the RPAs involve off-site mitigation (e.g., habitat improvements in estuaries and mainstem tributaries): modifying hydroelectric actions alone is insufficient to avoid jeopardy, habitat improvement is also necessary.

The FCRPS BO illustrates that the environmental baseline is degraded within the action area and throughout the impounded Columbia and Snake Rivers. Maintaining current hydroelectric practices without additional improvements in habitat, harvest and hatchery areas would jeopardize the continued existence of endangered SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SR steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead ESUs.

2.1.2.4.3 Agricultural Water Use

Water quantity problems are a significant cause of habitat degradation and reduced fish production. The water quantity issues are more acute in individual tributaries, but their indirect effects extend to mainstem Snake and Columbia River habitats. Millions of acres of land in the Snake and Columbia River basins are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion. Withdrawals in the Snake Basin have a substantial affect on summer flows, and therefore, indirectly influence water temperature, water particle travel time, and sediment transport. Tail water from irrigated fields contributes sediment, nutrients and pesticides to the action area (NMFS 2000).

2.1.2.4.4 Land Use and Shoreline Development

The action area is affected by a range of land uses and varying levels of shoreline development. Crop land, marinas, docks, residential dwellings, roads, railroads, rip-rap, and landscaping have displaced natural habitat features. In terms of the MPI, this land use and shoreline development has primarily affected the Habitat Elements and Channel Condition and Dynamics pathways. In general, shoreline development has reduced the quality of nearshore salmonid habitat by eliminating native riparian vegetation, (contributing to the *not properly functioning* status for Large Woody Debris and Refugia indicators); displacing shallow water habitat with fill materials (contributing to the *not properly functioning* status for the Off-Channel Habitat indicator); and by further disconnecting the Snake and Columbia Rivers from historic floodplain areas (contributing to the *not properly functioning* status for the Floodplain Connectivity indicator). Additionally, agricultural land use (e.g., grazing, growing crops, irrigating) has reduced the quality of riparian buffers and the stability of soils adjacent to rivers and streams. Without adequate buffers and effective soil stabilization, sediments are easily eroded and transported to surface waters where they accumulate. Although smaller tributaries may be affected initially, erosion and sedimentation ultimately affect mainstem portions of the Snake and Columbia Rivers. Some areas, such as Lower Granite Reservoir, have chronic problems with sedimentation and require routine dredging (Reckendorf and Pedone 1989; COE 2001).

2.1.3 Effects of the Proposed Action

The NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or Critical Habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 C.F.R.§ 402.02).

2.1.3.1 Direct Effects

Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not direct effects of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated.

The direct effects of the proposed DMMP would result from activities that would commence during the 2002-2003 project phase. These activities include dredging and in-water dredged material disposal. The primary direct effects of these activities include (1) turbidity, (2) suspension of contaminants, (3) entrainment of juvenile salmonids, (4) loss or alteration of SRF spawning habitat, and (5) filling of shallow water habitat.

2.1.3.1.1 Turbidity

Dredging and the in-water disposal of dredged materials would disturb and suspend a significant volume of benthic sediment. In the immediate vicinity of these activities, turbidity would likely substantially exceed natural background levels, potentially affecting listed fish.

Quantifying turbidity levels, and their effect on fish species, is complicated by several factors. First, turbidity from an instream activity will typically decrease as distance from the activity increases. How quickly turbidity levels attenuate is dependent upon the quantity of materials in suspension (e.g., mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. Second, the impact of turbidity on fishes is not only related to the turbidity levels, but also the particle size of the suspended sediments.

For salmonids, turbidity elicits a number of behavioral and physiological responses (i.e., gill flaring, coughing, avoidance, increase in blood sugar levels) which indicate some level of stress (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985; Servizi and Martens 1992). The magnitude of these stress responses is generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982; Servizi and Martens 1987; Gregory and Northcote 1993). Although turbidity may cause stress, Gregory and Northcote (1993) have

shown that moderate levels of turbidity (35-150 NTU) accelerate foraging rates among juvenile chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

When the particles causing turbidity settle from the water column, they contribute to sedimentation. Sedimentation can cause the following effects: (1) buried salmonid eggs or embryos may be smothered and suffocated, (2) prey habitat may be displaced, and (3) future spawning habitat may be displaced (Spence *et al.* 1996). Additionally, turbidity and subsequent sedimentation can affect the quality of stream substratum as spawning material, influence the exchange of streamflow and shallow alluvial groundwater, depress riverine productivity, and contribute to decreased salmonid growth rates (Waters 1995; Newcombe and Jensen 1996).

The type of dredging equipment used would significantly influence turbidity levels. The COE is proposing the use of two types: mechanical and hydraulic. Mechanical dredging involves a clamshell, scoop, shovel or other device that removes sediments by excavation. Mechanical dredging has the potential to create turbidity primarily where the excavation is occurring as the interface between the excavating apparatus and sediments is not contained. Some mechanical devices are designed to avoid releasing sediments during transportation through the water column, thus limiting turbidity to the excavation phase of the dredging. Hydraulic dredging involves suction devices that remove sediments by liquefying them and then transporting them in a contained tube or other apparatus to a disposal or transportation site such as a barge. Hydraulic dredging typically generates less turbidity than mechanical dredging as the majority of mobilized sediments are captured by suction. However, the dewatering process that is associated with hydraulic dredging could reintroduce significant amounts of sediments and cause additional turbidity.

It is expected that turbidity resulting from dredging and dredged material disposal would be intense in the vicinity of the activity themselves, but would rapidly attenuate with time and space. The COE would implement a number of techniques to minimize turbidity effects resulting from project operations. First, the COE would monitor turbidity levels and modify dredging operations to avoid prolonged negative effects (see Section 1.3). Second, the COE would complete the majority of dredging and disposal operations during a period when listed salmonids are not abundant. Of the listed ESUs, only SRF chinook (adults, and possibly stream type juveniles) and SR steelhead (adults) would be present in the action area during this work window. Third, the COE would attempt to dispose silts in a manner to limit their exposure to listed fish - ensuring that no in-water disposal site receives more than 30 percent silt. Finally, the COE would use best management practices at disposal locations to prevent remobilization of sediments, and subsequent turbidity, through dewatering activities or storage.

2.1.3.1.2 Suspension of Contaminants

Disturbing benthic sediments through dredging and in-water disposal could mobilize and distribute a variety of contaminants. The COE has identified PAHs, organophosphates, chlorinated herbicides, ammonia, oil, grease, glyphosate, ampa, dioxin, heavy metals, and others as potential contaminants. Some of these contaminants may be acutely or chronically harmful to

salmonids (Allan and Hardy 1980). However, many have unknown effects on salmonids or lack defined regulatory exposure criteria (Ewing 1999).

The degree to which contaminants would be suspended during dredging and in-water disposal, and the effects of the contaminants on listed salmonids are not clear. The COE has tested sediments for contaminants across the majority of areas where dredging is proposed. The COE has not found contaminants in concentrations that exceed existing regulatory criteria. However, regulatory criteria have not been designated for all contaminants or life history events that may be relevant to listed salmonids.

Another area of uncertainty is how dredging or in-water disposal actually distributes contaminants. If the dredging equipment contains the sediments effectively after excavation or suction, the distribution of contaminants would be greatly minimized. Conversely, if contaminated sediments are not contained effectively, they could be widely distributed. This is the primary concern with in-water disposal activities. In-water disposal would involve dumping sediments directly from a barge into the water, potentially resuspending any contaminants present. The COE, however, has tested sediments within most of the action area and determined that they would not, with the exception of silty substrates, exceed existing regulatory thresholds for a range of contaminants. The COE has determined that most contaminants are bound to fine particulate sediments (e.g., silt) and, therefore, will limit the extent to which they are disposed in water.

If contaminants are released during dredging or disposal activities, their effects may be subtle and difficult to directly observe. The effects of bioaccumulation are of particular concern as pollutants can reach concentrations in higher trophic level organisms (e.g., salmonids) that far exceed ambient environmental levels (Allan and Hardy 1980). Bioaccumulation may therefore cause delayed stress, injury or death as contaminants are transported from lower trophic levels (e.g., benthic invertebrates or other prey species) to predators long after the contaminants have entered the environment or food chain. It follows that some organisms may be adversely affected by contaminants while regulatory thresholds for the contaminants are not exceeded during measurements of water or sediments.

Exposure to sublethal levels of contaminants may have serious implications for salmonid health and survival. Recent studies have shown that low concentrations of commonly available pesticides may induce significant sublethal effects on salmonids. Scholz *et al.* (2000) and Moore and Waring (1996) have found that diazanon interferes with a range of physiological biochemical pathways that regulate olfaction and, consequently, homing, reproductive and anti-predator behavior of salmonids. Waring and Moore 1997 also found that the carbamate, carbofuran, had significant effects on olfactory mediated behavior and physiology in Atlantic salmon (*Salmo salar*). Ewing (1999) reviewed scientific literature on the effects of pesticides on salmonids and identified a wide range of sublethal effects: impaired swimming performance, increased predation on juveniles, altered temperature selection behavior, reduced schooling behavior, impaired migratory abilities, and impaired seawater adaptation.

Other non-pesticide compounds that are common constituents of urban pollution and agricultural runoff also adversely affect salmonids. Exposure to chlorinated hydrocarbons and aromatic hydrocarbons causes immunosuppression and increased disease susceptibility (Arkoosh *et al.* 1998). In areas where chemical contaminant levels are elevated, disease may reduce the health and survival of affected fish populations (Arkoosh *et al.* 1998). Throughout the lower SR, high concentrations of ammonia have been found in areas where fine sediments (silt) are prevalent (COE 2001). Because ammonia is so common in fine sediments, it is expected that ammonia would be a primary concern during dredging and disposal operations. Ammonia is toxic to fish - especially when the pH is relatively high (above 7.5) as is the case in the SR (COE 2001). However, ammonia does not have bioaccumulation potential common to fat soluble organic compounds.

As noted above, there is a growing body of literature that suggests small amounts of certain contaminants may affect the biology of salmonids. At present, regulatory thresholds are likely inadequate to account for these effects (i.e., some contaminants do not have salmonid exposure criteria or bioaccumulation criteria). It is expected that exposure criteria will be refined and expanded in the future.

In the meantime, the COE has committed to conservation measures that minimize the exposure of listed salmonids to contaminants: (1) the COE would conduct major dredging and disposal activities during the winter when listed salmonids are not abundant. Of the listed ESUs, only SRF chinook (adults, and possibly stream type juveniles) and SR steelhead (adults) would be present in the action area during this work window, (2) the COE would continue to sample sediments for contaminants and refrain from disposing of contaminated sediments in-water, (3), In no case, will an in water disposal area receive more than 30 percent silt. More typically, as is proposed at the Chief Timothy HMU site, shallow water habitats will be enhanced by adding sand and the silts will be reserved for capping the riparian bench, (4) the COE would implement BMPs to prevent fuels spills, hydraulic leaks, etc. during dredging and disposal operations, and (5) the COE would continue to monitor scientific literature to update/determine which chemicals adversely affect listed salmonids, at what concentrations the effects occur, and which means of sampling are most appropriate for specific contaminants.

In the future, the COE would also be responsible for utilizing sediment monitoring data and the results of additional scientific studies, in an adaptive management context, to refine operations under DMMP to minimize harm to listed species from contaminant exposure to the maximum extent practicable.

2.1.3.1.3 Entrainment and Harassment

Dredging devices have the potential to capture or entrain juvenile salmonids or embryos. Mechanical and hydraulic dredging techniques each pose some risk. Mechanical dredging is most likely to affect non-mobile salmonids (i.e., early life history stages), while hydraulic techniques could conceivably capture both non-mobile and mobile juvenile salmonids. Previous dredging activities in the SR have resulted in entrainment of listed chinook: developing embryos

and alevins were accidentally collected in a mechanical dredging operation that took place downstream of the Lower Monumental Dam in 1992 (COE 1992).

The COE has committed to a number of conservation measures to reduce the probability of entrainment occurring during future dredge operations. First, the majority of dredging activities would be accomplished using mechanical means. Mechanical dredging would minimize the risk posed to swimming juveniles. Hydraulic dredging would only be performed in areas where the water temperature is at or exceeds 70 degrees Fahrenheit (rearing fall chinook appear to avoid temperatures greater than 70 degrees Fahrenheit (Easterbrooks 1995-1998)). Second, the COE has committed to thoroughly survey areas where redds are likely to occur (e.g., immediately below dams) prior to dredging, and then dredge around or otherwise avoid the redd if encountered. Third, the COE would complete dredging operations in winter when listed salmonids are not expected to be abundant. Of the listed ESUs, only SRF chinook (adults, and possibly stream type juveniles) and SR steelhead (adults) would be present in the action area during this work window.

NOAA Fisheries believes the probability of entrainment of adult steelhead is very low, and the probability of entraining adults of other listed species under NOAA Fisheries jurisdiction is zero. NOAA Fisheries believes further that the number of juvenile SRF fall chinook likely to be entrained is low, and that it is likely that no juveniles of other listed species would be entrained. Finally, NOAA Fisheries expects that SRF chinook and SR steelhead will be only nominally affected be the act of avoiding dredging operations. The conservation measures to be implemented by the COE sufficiently address the situations where entrainment and harassment are likely to occur.

2.1.3.1.4 Removal/Alteration of Spawning Habitat

As mentioned previously, SRF chinook spawning habitat had been substantially reduced by the development of the Federal hydro power system. SRF chinook spawning has been documented near lock entrances at SR dams (COE 2001), but it is not known if such spawning is successful. It is probable that shipping traffic through the locks substantially reduces the viability of SRF chinook redds constructed there. Clearly, it is not desirable from a fish management perspective for listed fish to spawn at lock entrances. Dredging of these sites is likely to reduce their suitability as spawning habitat, and, in turn, the amount of spawning that will occur in these areas.

The COE has not committed to the enhancement or creation of SRF chinook habitat elsewhere in the action area, but has expressed an interest doing so. They have committed to ensure that dredging operations do not adversely affect existing SRF chinook redds over the life of the DMMP.

2.1.3.1.5 Fill of Shallow Water Habitat

The creation of the riparian planting bench at the Chief Timothy HMU site would entail filling 18 acres of shallow water habitat. Substrate within the affected area is almost uniformly silt (COE 2002), a substrate type not preferred by listed ESUs in the action area (Bennett *et al.*1997). Sediment disposal plans for the site also include capping approximately 16 acres of silty substrate with a mantle of sand, thereby increasing the suitability of the this acreage as SRF rearing habitat. Further, the channel encroachment created by the planting bench is expected to slightly increase local water velocities which should encourage the further replacement of silty substrates with larger, more preferred substrate particle sizes.

The COE has committed to a number of conservation measures that would minimize or avoid impacts to shallow water habitat within the action area. First, the subject site supports only low quality rearing habitat. While roughly 18 acres will be filled, the proposed action would substantially enhance roughly 16 acres of poor quality rearing habitat. Second, the COE has committed to an adaptive management program for the enhancement of shallow water habitat throughout the action area over the life of the DMMP. Therefore, the short and long term loss of this low quality habitat is expected to be offset by short and long term gains in habitat quality proximal to the lost habitat and by long term gains in rearing habitat quality and quantity within the action area. Third, the creation of the riparian planting bench is expected to contribute a more complex array of food items over the long term. Taken in combination, these conservation measures should more than offset the adverse effects of filling shallow water habitat at the Chief Timothy site.

2.1.3.1.5 Alteration of Benthic Habitat

Dredging would remove some quantity of benthic salmonid habitat. The proposed in-water disposal plan also has to potential to create shallow-water benthic habitat.

Within the footprint of dredging operations, benthic habitat features would be physically removed. One impact of this habitat removal would be the temporary loss of some potential prey species (invertebrates) and their habitat. Aquatic invertebrates, particularly dipterans, are an important food item of juvenile chinook salmon and steelhead in the Lower SR (Bennett and Shrier 1986, Curet 1994).

The majority of dredging would focus on navigation lanes where oligachaetes and chironomids (dipterans) are the dominant invertebrates. Populations of these invertebrates are not likely to be substantially affected by dredging operations as they occupy habitat types that are prone to disturbance under natural conditions. Post-dredging recolonization would likely occur rapidly through drifting and crawling from adjacent non-disturbed areas (e.g., Mackay 1992). Because the dredging would focus mainly on a relatively narrow portion of the river bed (navigation lanes), and because the dredging itself would not render these areas unsuitable for oligachaetes and chironomids, the temporary loss of invertebrate habitat is unlikely to limit food production or significantly affect foraging opportunities within the reservoirs.

Dredging may also disrupt complex nearshore rearing habitats by physically removing them. Rearing habitats include functional elements such as foraging areas, thermal and velocity refugia, cover, and food. Bennett (1997) identified shallow sandy, nearshore areas as important rearing areas for juvenile fall chinook in the lower SR. Zimmerman and Rasmussen (1981) and Easterbrooks (1995-1998) found that chinook salmon also rear in some low velocity, vegetated backwater areas of the CR (e.g., Casey Ponds). Although these types of habitat are not common throughout most of the dredging footprint (navigation lanes), they may exist near boat basins, swimming beaches, or boat launches (COE 2001).

To reduce the adverse affects of habitat alteration that may occur through dredging, the COE proposes to construct nearshore rearing habitat through dredged material disposal. The goal of this habitat construction would be to mimic the shallow, sandy rearing conditions favored by some fall chinook juveniles (Bennett *et al.* 1997). This type of habitat has been successfully constructed following previous dredging operations (Bennett *et al.* 1997). The creation of rearing habitat with dredged materials is a promising prospect that may replace habitat functions lost as a result of dredging activities.

2.1.3.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur (50 C.F.R. § 402.02). Indirect effects can occur outside of the area directly affected by the action. Indirect effects can include other Federal actions that have not undergone Section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or they are a logical extension of the proposed action. The indirect effects that would result from the proposed implementation of the DMMP include: (1) continued anthropogenic sedimentation of the action area, and (2) continued dredging, and the attendant effects thereof beyond the term of the DMMP.

2.1.3.2.1 Anthropogenic Sedimentation.

It is believed that dredging interacts with sediment erosion and deposition in the SR Basin. Initial work by Reckendorf and Pedone (1989) implicates erosion from forestry and agricultural practices as major contributors of sediment to the Snake and Clearwater Rivers. Because maintenance of the navigation channel is critical to sustaining agricultural production, as well as other industries within the basin (through maintenance of inland shipping routes), it can be argued that the effects of these industries to listed fish are to some extent an indirect effect of maintenance dredging.

Dredging provides a functional navigation system along the slack waters of the lower SR and downstream to the Columbia River and Pacific Ocean. This navigation system provides shippers a means of transporting goods to and from inland ports. According to the COE (2001) wheat, barley, wood chips, and other wood products are the primary commodities bound downstream while petroleum and fertilizer are the primary commodities bound upstream. The COE (2001)

has determined that these shipments depend on the availability of a navigation system that provides a 14-foot draft channel for barge tows.

The predominance of agricultural commodities (wheat, barley, fertilizer) in barge commerce indicates that this industry has strong economic interests in the maintenance of the navigation system. Barging appears to be a significant factor in determining the profitability of the major crops in the SRB. For instance, Jessup and Casavant (1998) determined that without river navigation above the Tri-Cities (at any time during the year), grain farmers and shippers would be adversely affected. In their analysis they compared scenarios where wheat and barley were transported using rail shipments instead of barge shipments. They estimated that transportation costs would increase, on average, 1 cent/bushel for wheat and 6.8 cents/bushel for barley when no constraints on the volume of rail shipments existed (cost increases are based on initial figures of 49.61 cent/bushel for wheat and 28.31 cent/bushel for barley). In the more likely scenario that rail capacity was constrained (110 percent of historical volume) average transportation costs increase 4.2 cents/bushel and 6.8 cents/bushel for wheat and barley, respectively. However, there would be some variation in the cost increase with some shippers experiencing little or no change in transportation costs and some shippers experiencing up to 7 cents/bushel for wheat and 13 cents/bushel for barley.

Moving agricultural products solely by truck instead of barging would also increase transportation costs. It costs approximately $800 to move a 47,000-pound container of lentils round-trip by truck between a load center in the Palouse and Portland's terminal 6. It costs approximately $350 round-trip to move the same container via truck and barge combination (Ellis 1999). It is not correct to assume that the agriculture industry exists solely because of the navigation system as it predated the installation of the mainstem dams on the Snake and Columbia Rivers, but it is reasonable to assume that agricultural production levels are affected by the cost of shipping products and supplies (Jessup and Casavant 1998).

In this consultation, agricultural land use is particularly relevant to dredging because it is suspected to be one of the primary causes of sedimentation which, in turn, necessitates frequent dredging. Reckendorf and Pedone (1989) implicated agricultural land use in the Clearwater, Grande Ronde, and SRB as major anthropogenic sources of sediments. By dredging the navigation system, the COE may be enabling land use activities that contribute to sedimentation or the Lower SR reservoirs, and upstream habitats. If the navigation system is maintained, agricultural land use practices, and potentially sedimentation, would be expected to continue at a similar rate. Alternatively, if the navigation system were not maintained, agricultural activity might decline, resulting in a decrease in sedimentation.

While agriculture and other sediment producing activities benefit from the maintenance the navigation system on the Columbia and Snake Rivers, the specific land management practices employed in commodity production are not influenced by the navigation system. For example, the presence of the navigation system does not influence the type of tillage system employed by upstream farmers. In other words, implementation of the DMMP will contribute to increased

sedimentation, but the amount of sedimentation will be determined by factors beyond the COE's control.

In that the COE is saddled with the task of dredging and redistribution of sediments originating outside of the action area, they have an interest in reducing the amount material that must be so handled. The COE intends to consult with the Local Sediment Management Group (LSMG), a group that includes representative of multiple Federal, state, and local agencies and entities, regarding the need for and potential scope of follow up studies to Reckendorf and Pedone (1989). The COE intends to solicit the help of LSMG member organizations in conducting any such studies relating to activities under the control of member organizations. Further, the COE would seek authorization and appropriations to conduct a general investigation study on issues they determine to be related to activities under their control.

2.1.3.2.2 Altered Channel Morphology

As mentioned previously, the levee system in the Lewiston/Clarkston vicinity is designed to provide flood protection up to a 100 year flood. Raising the levees three feet in order to achieve protection for up to a 400 year flood could, in the event of such a flood, contribute to changes in local channel morphology. However, the effects to local channel and habitat conditions would likely be insignificant as compared to the habitat changes that would occur throughout the area affected by such a flood. Therefore, the three foot levee raise is not expected to adversely affect listed species.

2.1.3.3 Population Level Effects

As described in Section 2.1.2.2, NOAA Fisheries has estimated the median population growth rate (lambda) for each species potentially affected by the implementation of the DMMP. The proposed action would seasonally increase turbidity and the risk of contaminant exposure local to dredging and disposal operations over the life of the DMMP. Dredging may result in the entrainment of a small number of fall chinook (i.e., those employing a stream type life history), and material disposal would destroy 18 acres of low quality shallow water rearing habitat at the Chief Timothy HMU site. However, the effects of the proposed action will be minimized through timing, disposal technique, extensive monitoring, adaptive management, and equipment selection. Further, the use of dredge spoils to enhance shallow water and riparian habitat has the potential to more than offset the loss of filled habitat and the disturbance of benthic habitats as anticipated in the proposed action. The remainder of the proposed disposal sites are either upland or sites that are not presently believed support SRF chinook rearing. Taking all these factors into account, NOAA Fisheries does not believe that the proposed action is likely to influence existing population trends or risks for NOAA Fisheries' listed species within the action area.

2.1.3.4 Effects on Critical Habitat

The NOAA Fisheries designates Critical Habitat for a listed species based upon physical and biological features that are essential to that species. Essential features of Critical Habitat for endangered SR sockeye, threatened SRF chinook, and threatened SRSS chinook, include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (58 Fed. Reg.68543, December 28, 1993).

As discussed previously, implementation of the DMMP would cause both transient and longer term impacts to Critical Habitat. Transient effects, including turbidity and the resuspension of contaminants, will occur largely concurrent with dredging and in-water disposal activities. In terms of the essential features of Critical Habitat, turbidity and contaminants may decrease water quality and food availability.

Longer term effects include the alteration and removal of substrate suitable for SRF chinook spawning, alteration of benthic habitat, and the filling of shallow water habitat. As mentioned previously, SRF chinook have been documented spawning near and within navigation lock entrances. It is not known whether spawning in these areas has been successful, but, in that redds so located would be at risk of damage from boat traffic, it is not desirable that SRF chinook spawn there. While the COE proposes to dredge areas that may contain suitable spawning gravels, they will avoid damaging known redds. It will be important to assess other options for SRF chinook spawning habitat enhancement. Removing benthic habitat during dredging will decrease the abundance of some food items for perhaps a year or two and may impact the quality of certain rearing areas. However, the COE proposes to construct and enhance shallow water rearing habitat at multiple sites. The loss of rearing habitat functions (e.g. food production, foraging areas, temperature and velocity refugia) that may result from dredging are likely to be replaced by constructed and enhanced habitat. Further, the establishment of riparian vegetation at the Chief Timothy site would likely increase the diversity and quantity of food items available over the long term.

It appears that dredging may have an indirect influence on sedimentation by helping to maintain the economic viability of industries whose land use practices cause high levels of anthropogenic sedimentation. The COE would work with the LSMG to determine the need for and extent of additional investigations into sediment sources. The COE would also cooperate with LSMG member organizations on studies relating to activities or geography under the jurisdiction of member organizations. Finally, the COE would seek authorization and appropriations to conduct a general investigation study of sedimentation issues it determines to be under its control.

When all of the above factors are considered, it does not appear as though the proposed action is likely to diminish the value of essential features of Critical Habitat to the detriment of survival or to a point that would impede the recovery of listed fish. Consequently, the implementation of the DMMP (2002-2003 project operations and 20 year conceptual plan) would not adversely modify the Critical Habitat of SR sockeye, threatened SRF chinook, or threatened SRSS chinook.

2.1.4 Cumulative Effects

Cumulative Effects are defined in 50 C.F.R. § 402.02 as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For this analysis, cumulative effects for the general action area are considered. Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities have been or will be reviewed through separate Section 7 consultation processes.

Throughout the action area, much of the land is likely to remain rural and used for agricultural purposes. However, most arable lands have been developed and water resource development has slowed in recent years. Increasing environmental regulations and diversification in local economies has reduced some impacts that have been previously associated with water and land use by agriculture and extractive industries.

The State of Washington has also implemented a number of strategies to improve habitat for listed species. The 1998 Salmon Recovery Planning Act provided the framework and a funding mechanism for developing watershed restoration projects. It also created the Governor's salmon Recovery Office to coordinate and assist in the development of salmon recovery plans. Washington's "Statewide Strategy to Recover Salmon," for example, is designed to improve watersheds (NMFS 2000).

The Watershed Planning Act, also passed in 1998, encourages voluntary planning by local governments, citizens, and Tribes for water supply and use, water quality, and habitat at the Water Resource Inventory Area or multi-Water Resource Inventory Area level. Grants are made available to conduct assessments of water resources and to develop goals and objectives for future water resources management. The Salmon Recovery Funding Act established a board to localize salmon funding. The board will deliver funds for salmon recovery projects and activities (NMFS 2000).

WDFW and tribal co-managers have been implementing the Wild Stock Recovery Initiative since 1992. The co-managers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The plans also concentrate on actions in the harvest and hatchery areas, including comprehensive hatchery planning. The department and some western Washington treaty Tribes have also adopted a wild salmonid policy to provide general guidance to managers on fish harvest, hatchery operations, and habitat protection and restoration measures to better protect wild salmon runs (NMFS 2000).

Water quality improvements may result from the development of total maximum daily load restrictions (TMDL) for a range of pollutants. The state of Washington is under court orders to develop TMDL management plans for each water body listed as water quality limited under Section 303 (d) of thee Clean Water Act. It has developed a schedule that is updated yearly; the schedule outlines the priority and timing of TMDL plan development (NMFS 2000).

Washington State withdrew the water of the mainstem CR from further appropriation in 1995. Currently, all applications for new water withdrawals are being denied based on the need to address ESA issues. The state established and funds a program to lease or buy water rights for instream flow purposes. This program was started in 2000 and is in the preliminary stages of public information and identification of potential acquisitions. These water programs, if carried out over the long term, should improve water quantity and quality in the state (NMFS 2000). However, there is significant pressure within the state to begin appropriating water directly from the Columbia and Snake Rivers and from local aquifers that may be hydraulically connected to the Columbia. Within this paradoxical dynamic, it is difficult to predict long term trends in water quantity and quality.

2.1.5 Conclusion/Opinion

NOAA Fisheries' jeopardy analysis is based upon the present status of the species, environmental baseline within the action area, and the effects of the proposed action. The analysis takes into account the species' status because determining the effect upon a species' status is the essence of the jeopardy determination. Depending on the specific considerations of the analysis, actions that are found likely to impair presently properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat towards properly functioning condition at the population or ESU scale will generally be determined likely to jeopardize the continued existence of listed salmon, adversely modify critical habitat, or both. Specific considerations include whether habitat condition was an important factor for the decline in the listing decision, changes in population or habitat conditions since listing, and any new information that has become available.

NOAA Fisheries has determined that the effects of the proposed action will not jeopardize the continued existence of SR sockeye, SRF chinook, SRSS chinook, SR steelhead, UCRS chinook, UCR steelhead, or MCR steelhead. The proposed action is not expected to degrade baseline habitat functions necessary for the survival and recovery of any of the subject species. The action would cause transitory turbidity and increase the probability of injury or death through entrainment, but these effects would not affect long-term baseline habitat functions. The proposed action would also mobilize contaminants, potentially injuring or killing listed fish. Existing regulatory thresholds are probably inadequate to account for the range of contaminant-related impacts that may affect listed salmonids in the action area. However, the COE would minimize exposure risks through conservation measures and by adopting an adaptive management strategy to which DMMP operations would be responsive.

Implementation of the DMMP would remove some benthic habitat and fill 18 acres of shallow water habitat. However, virtually all of that 18 acres is judged to be poor quality rearing habitat. Further, the proposed action includes plans to enhance existing and create additional shallow water rearing habitat. These techniques have been used previously by the COE, and SRF chinook were shown to utilize enhanced habitats. The proposed action will also remove relatively small amounts of gravels and cobbles in areas (near and within navigation lock entrances) where SRF chinook have spawned in some years. This action may modify site

conditions to the point that SRF chinook no longer spawn in these areas. As mentioned previously, it is not known if such spawning is successful, but redds so located are believed to be at substantial risk or damage from barge traffic. The indirect effects of the proposed action also include anthropogenic sedimentation. The COE has committed to better understand this issue and is willing to attempt to address the problem as described previously.

Overall, the direct and indirect effects attributable to the proposed action are not expected to degrade the environmental baseline to the extent that the survival and recovery of listed salmonids would be compromised. NOAA Fisheries relied on the best scientific and commercial information available in making this determination. Despite the effects described above, the proposed action is unlikely to influence present population trends or risks. Accordingly, at no time, and without contingencies, will the activities described in this BO cause levels of take or destroy habitat that would appreciably reduce the likelihood of survival and recovery of the subject listed species.

2.1.6 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or action area, to help implement recovery plans, or to develop additional information.

To reduce the cumulative effects of sedimentation and dredging within the action area, NOAA Fisheries recommends that the COE coordinate and collaborate with other state and Federal agencies to use their collective authorities to address anthropogenic erosion problems upstream of the action area. NOAA Fisheries further recommends that this effort include measures to reduce contaminant loads, ammonia in particular, associated with sedimentation. The COE will seek authorization and appropriations to conduct a general investigation study on issues that the COE determines relate to activities and/or areas within its control.

To reduce the cumulative effects of the loss of SRF chinook spawning habitat with the action area, NOAA Fisheries recommends that the COE explore opportunities to create spawning habitat away from the navigation channel and lock facilities.

NOAA Fisheries requests notification of the implementation of any conservation recommendations.

2.1.7 Reinitiation of Consultation

Consultation must be reinitiated if (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; or (3) a new species is listed or Critical Habitat is designated that may be affected by the action (50 C.F.R.§ 402.16).

The COE must monitor the implementation of listed reasonable and prudent measures and terms and conditions of the incidental take statement. The COE must reinitiate consultation if elements of the proposed project are implemented in a manner that is inconsistent with, or deviates from, the terms and conditions of this consultation. To reinitiate consultation, the COE must contact the Habitat Conservation Division (Washington Branch Office) of NOAA Fisheries.

2.2 Incidental Take Statement

Section 9 of the ESA and Federal Regulation pursuant to Section 4 (d) of the Act prohibit the take of endangered and threatened species without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as spawning, rearing, feeding, and migrating (50 C.F.R. § 222.106; 64 Fed. Reg. 60727; November 8, 1999). Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or applicant carrying out an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and is not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary; in order for the exemption in Section 7(o)(2) to apply, they must be implemented by the action agency. The COE has a continuing duty to ensure that the action is implemented in accordance with this incidental take statement. If the COE fails to comply with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and set forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of the Take

The NOAA Fisheries anticipates that incidental take of SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SR steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead is reasonably certain to result from project activities as described in the BO. Despite the use of the best scientific and commercial data available, NOAA Fisheries cannot estimate a specific amount of incidental take of individual SR adult steelhead, SRF chinook juveniles, embryos, or incubating eggs, but estimates the amount of incidental take of other NOAA Fisheries listed species at near zero. The mechanisms and extent of expected effects are summarized below.

The NOAA Fisheries believes that there are several mechanisms by which take would occur. Direct harm or injury may result from dredging actions or inwater disposal where turbidity is

generated, contaminants are mobilized, or dredging equipment entrains fish. Indirect harm, through long term habitat modification could occur by the physical removal of benthic habitat during dredging, by the filling of shallow water habitat, or by frequent dredging to address anthropogenic sedimentation. Indirect harm could also result if the conservation measures and reasonable and prudent measures described in this BO are disregarded.

The extent to which these mechanisms can result in effects on listed salmonids, or their habitat, can be described qualitatively, enabling reinitiation of consultation if such effects are exceeded during the project. The following descriptions indicate the action that could potentially cause take and the threshold value(s) or condition where take would exceed levels anticipated by this consultation: (1) In water work (i.e., the risk of turbidity, contaminant mobilization, and entrainment) would only occur during winter work windows or when water temperatures exceed 70 degrees Fahrenheit, (2) Hydraulic dredging (i.e., risk of entrainment) would only occur when water temperatures exceed 70 degrees Fahrenheit, (3) No in-water disposal site (i.e., risk of turbidity and contaminant mobilization) would receive more than 30 percent silt, and the COE will attempt to use silts in a manner (e.g., capping for riparian bench) that minimizes exposure of listed fish to silts, (4) Redd surveys would be conducted prior to dredging (i.e., risk of entrainment) in potential spawning areas, (5) Dredging would be limited to the footprints described in this BO -conveyance/capacity dredging would not occur (i.e. risk of long term habitat degradation.)

2.2.2 Reasonable and Prudent Measures

The NOAA Fisheries believes that the following reasonable and prudent measures (RPMs) are necessary and appropriate for minimizing take of SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SR steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead

1. The COE will minimize take of listed species through implementing conservation measures.

2. The COE will monitor DMMP operations to minimize take.

3. The COE will adaptively manage DMMP operations to minimize take.

4. The COE will minimize take by conducting DMMP activities so that they do not contribute to anthropogenic sedimentation.

2.2.3 Terms and Conditions

To be exempt from the prohibitions of Section 9 of the ESA, the COE must comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures described above. These terms and conditions are non-discretionary.

1. Implement RPM No. 1 by conducting the following

   1.1 In-water work will occur in prescribed work windows (December 15 through March 1 in the Snake and Clearwater Rivers, and December 1 to March 31 in the Columbia River). Hydraulic dredging may occur outside of these windows but only when water temperature in the area to be dredged exceeds 73 degrees Fahrenheit. While juveniles SRF chinook have been show to avoid water temperatures greater than 70 degrees Fahrenheit, in-water work will be delayed until water temperature exceeds 73 degrees Fahrenheit to ensure there are no SRF chinook in the area. Hydraulic dredging will only occur at the boat basins, swim beaches, and irrigation intakes listed in Section 1.3.1.1 of this BO.

   1.2 No in-water disposal site will receive more than 30 percent silt. The COE will further attempt to dispose silts in a manner that minimizes exposure risks to listed fish.

   1.3 Dredging at lock approaches will only occur after redd surveys have been conducted.

2. Implement RPM No. 2 by conducting the following

   2.1 In accordance with the project description provided in Section 1.3 of this BO, water quality and sediment contaminant monitoring will be performed in accordance with the Lower Columbia River Dredged Material Evaluation Framework (DMEF) (COE *et al* 1998). Specific concerns at any given dredging or disposal site should be addressed with site specific monitoring after the dredging or disposal has occurred.

   2.2 In areas where contaminant analyses have yet to be performed, a randomized, non-biased sampling design will be implemented for sample collection. In accordance with the joint EPA/COE guidance presented in the DMEF, tier I and tier II procedures will be used to determine where samples will be collected.

   2.3 Surveys will be conducted at lock forebays to determine whether redds are present in the dredging footprint. If the surveys are inconclusive, because of environmental conditions or other factors, dredging will be postponed until a definitive survey can be made. If a redd is found in the dredging footprint, the COE will avoid harming it.

   2.4 The COE will evaluate the benefits of newly constructed habitat/in-water disposal sites. Specifically, the COE will determine if new habitat locations function as intended -create rearing habitat for juvenile fall chinook.

2.5 To determine the potential impacts of DMMP operations in backwater areas (e.g., Joso barge slip, boat basins and swimming beaches), the COE will determine the spatial and temporal distributions of rearing salmonids, as well as identify key habitat attributes that explain the distributions within these areas..

3. Implement RPM No. 3 by conducting the following

3.1 The COE will use sediment contaminant analyses, the results of future studies, and future State and Federal regulations, where necessary, to avoid harming listed fishes. The DMMP and its operations will be updated or modified if new information or regulations are produced that indicate contaminant exposure criteria currently used by the COE are incorrect or insufficient to protect listed species.

4. Implement RPM No. 4 by conducting the following

4.1 The COE will bring the issue of anthropogenic sedimentation to the LSMG for further investigation concerning whether these industries still contribute significant quantities of sediment to the action area. If the LSMG determines that studies need to be conducted, the COE will cooperated with the agencies and entities on such studies within the limits of its authority.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));

- NOAA Fisheries shall provide conservation recommendations for any Federal or State activity that may adversely affect EFH (§305(b)(4)(A));

- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation

recommendations of NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to determine whether the proposed action may adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse impacts to EFH resulting from the proposed action.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed action and action area are detailed above in Section 1.3 of the BO. The action area includes habitats that have been designated as EFH for various life-history stages of coho and chinook salmon.

3.4 Effects of Proposed Action

As described in detail in Section 2.1.3 of this BO, the proposed activities may result in detrimental short and long-term effects to a variety of habitat parameters. These adverse effects are:

3.4.1 Turbidity resulting from dredging and in-water disposal of dredged materials

3.4.2 Mobilization of potentially contaminated sediments into the water column.

3.4.3 Removal of benthic habitat through dredging.

3.4.4 Removal of spawning substrate through dredging.

3.4.5 Additional sedimentation that may be fostered by dredging activities.

3.4.6 Fill of 18 acres of low quality SRF chinook habitat at the Chief Timothy HMU disposal site.

3.5 Conclusion

NOAA Fisheries believes that the proposed action may adversely affect designated EFH for coho and chinook salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. The conservation measures proposed in the BA will substantially minimize the adverse effects to EFH described above. NOAA Fisheries does not believe, however that the conservation measures alone fully address these adverse effects. NOAA Fisheries recommends that the COE adopt the Reasonable and Prudent Measures and the Terms and Conditions outlined in Section 2.2.2 of the BO in addition to these conservation measures as EFH conservation measures. If implemented by the COE, this suite of measures will sufficiently minimize adverse effects to EFH.

3.7 Statutory Response Requirement

Please note that the MSA and 50 CFR 600.920(j) require the Federal agency to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its receipt of this letter. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity. In the case of a response that is inconsistent with the EFH Conservation Recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

4.0. REFERENCES

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DREDGED MATERIAL MANAGEMENT PLAN
AND ENVIRONMENTAL IMPACT STATEMENT

McNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

ADDENDUM B TO THE BIOLOGICAL ASSESSMENT
PROVIDED TO THE NATIONAL MARINE FISHERIES SERVICE

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EXECUTIVE SUMMARY

This Addendum B to the Biological Assessment (BA) for the Dredged Material Management Plan and Environmental Impact Statement (DMMP/EIS) for McNary Reservoir and the Lower Snake River Reservoirs is in response to a change in the proposed beneficial use disposal site for the year-1 dredging and disposal action. During the 2002/2003 in-water work window the Walla Walla District of the U.S. Army Corps of Engineers (Corps) proposes to dispose dredged material along the southern shoreline of the Lower Snake River between river mile (RM) 131.6 through RM 133.4 near the Chief Timothy Habitat Management Unit (HMU) instead of the previously proposed Knoxway Canyon site at RM 116. The Chief Timothy upriver site will provide opportunity to restore a section of shoreline with 18.4 acres of woody riparian vegetation that would transition into 15.8 acres of improved shallow, open water rearing habitat for juvenile fall chinook salmon production. The mid-depth underwater bench near Chief Timothy HMU would be more accessible to the high densities of rearing fall chinook salmon pre-smolts and smolts that emigrate seasonally from the Wilma rearing habitat area. This addendum addresses the biological effects of the revised year-1 dredging and disposal action incorporated into the DMMP/EIS 20-year Plan, and provides that information to the National Marine Fisheries Service (NMFS) Washington State Habitat Conservation Branch in Lacey, Washington, for completion of their evaluation for Endangered Species Act (ESA) and Magnuson-Stevens Act (MSA) Essential Fish Habitat (EFH) consultation required for their Final Biological Opinion (BO) on the DMMP.

APPENDIX F ADDENDUM B
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1.0 INTRODUCTION

The Walla Walla District of the Army Corps of Engineers (Corps) drafted the Dredged Material Management Plan/Environmental Impact Statement (DMMP/EIS), which consists of two major elements: (1) dredging and disposal operations scheduled for 2002-2003 and (2) a 20-year conceptual plan. The DMMP operations scheduled for 2002-2003 encompass maintenance and navigation dredging, dredged material disposal, and monitoring activities. The 20-year conceptual plan addresses several studies that will commence prior to future dredging and disposal operations that are beyond the 2002-2003 schedule. Additionally, the 20-year plan addresses levee construction along Lewiston, Idaho shorelines and provides a basic framework for future DMMP activities and Endangered Species Act (ESA) consultations.

The Corps originally requested informal consultation with a Biological Assessment (BA) on the Interim Dredging measures on September 26, 2000. In their consultation request, the ACOE presented an effect determination of *may affect, not likely to adversely affect* ESA listed anadromous salmonids. The National Marine Fisheries Service (NMFS) did not concur with the effect determination and indicated that formal consultation (*may affect, likely to adversely affect*) would be appropriate given the temporal and spatial extent of the scope of the original proposal and the potential indirect impacts to listed species. The Corps subsequently requested formal consultation on the DMMP on June 27, 2001. NMFS determined that the original BA appeared sound but had some minor deficiencies, required clarification of certain objectives, and was in need of minor changes in the language of specific actions affecting ESA-listed threatened and endangered anadromous fish occurring in the project area. The Corps responded to this additional information request with an Addendum attached to the BA. After receipt of the addendum, formal consultation on the DMMP/EIS [including the originally proposed disposal plan at Knoxway Canyon (River Mile (RM) 116)] was initiated on September 27, 2001. The Corps received a draft Biological Opinion (BO) from NMFS on February 1, 2002.

The actions proposed in the DMMP may affect ESA-listed Evolutionarily Significant Units (ESUs) of endangered Snake River (SR) sockeye (*Oncorhynchus nerka*), threatened Snake River fall (SRF) chinook (*O. tshawytscha*), threatened Snake River spring/summer run (SRSS) chinook (*O.*

tshawytscha), threatened Snake River Basin (SRB) steelhead (*O. mykiss*), endangered upper Columbia River spring-run (UCRS) chinook (*O. tshawytscha*), endangered upper Columbia River (UCR) steelhead (*O. mykiss*), and threatened middle Columbia River (MCR) steelhead (*O. mykiss*), as well as the Critical Habitat and Essential Fish Habitat (EFH) for each ESU.

Since the drafting of the first Addendum the Corps is proposing an alternate beneficial use of the dredged material for 2002/2003. This change will increase quality and suitability of shallow water rearing habitat for Snake River fall chinook salmon. The Corps Woody Riparian program under the Lower Snake River Fish and Wildlife Compensation Plan (LSRFWCP) (ACOE 1976) is aimed at restoring woody riparian habitat acreage towards reducing the near 50% deficient identified since implementation of the LSRFWCP. Inclusion of the Woody Riparian program in 2002/2003 would shift disposal of dredged material from the currently proposed in-water disposal site at Knoxway Canyon (RM 116) to a more upriver site near Chief Timothy HMU (RM 132 through RM 133). Coordination with NMFS resulted in the drafting of this Addendum to the BA to provide NMFS a revised effects evaluation for incorporation into the NMFS Final BO.

2.0 CHANGES TO THE BIOLOGICAL ASSESSMENT

This section will address the requests for change of content and clarification of certain sections of the BA.

2.1 Proposed Modification in Disposal Activities for Winter 2002/2003

The dredging of the authorized navigation channel through the Snake and Clearwater river confluence will not be modified from the description in the BA. The disposal of the resultant material has been modified from the description in the BA in both location, design, and methods of placement. Both activities would occur during the established in-water work window of December 15 to March 1.

NOTE: A set of plates (N-2 through N-14) that outline the dredging areas proposed for FY 2003 are referenced in this addendum and included as part of Appendix N (DREDGING PROPOSED FOR WINTER 2002-2003).

The proposed site for in-water disposal of winter 2002-2003 material has been changed from the previously proposed Knoxway Canyon site at RM 116 to the Chief Timothy Habitat Management Unit (HMU) between RM 131.6 and RM 133.4 (Plates FB-1 and FB-2). Beneficial dredged material disposal at the new site is designed to accomplish two goals: (1) create planting zones for woody riparian habitat, and (2) increase suitability of shallow water rearing habitat for Snake River fall (SRF) chinook juveniles. Although the present depth at the proposed disposal area is suitable for SRF rearing and feeding, the current habitat is of marginal quality, largely due to the silt substrate that covers the bench. Currently we have little biological data at this location pertaining to salmonid use.". Bennett et al. (1997) sampled one transect across the bench as a reference early in their study for only one year. The close proximity to the high use Wilma area was believed to influence the results of the site. No disposal will occur upon this site until the site is adequately monitored during Spring and summer 2002 for the presence, use, and species composition of salmonids. If utilization of the site is found to be good to high, then disposal activities in 2002/2003 will not occur at Chief Timothy, but be moved to the originally planned and consulted site at Knoxway Canyon.

The Corps collected sediment samples in March 2002 from the area to be covered with dredged material. The majority of the proposed disposal site was composed of silt; except for a thin strip of sand immediately along the shoreline where the wave action had kept it clean. The silt and sand distribution was found to be quite similar to that observed aerial photographs taken during the 1992 drawdown test of Lower Granite Reservoir. The proposed disposal design also terminates immediately upriver from the larger island at RM 131.5, so as not to impede overflow into an old backwater habitat area and not fill material over a larger sand substrate zone associated with the riverward side of the island.

The proposed 2002-2003 disposal site currently consists of a shallow sloping bench (about 10 feet deep at maximum operating pool of water surface elevation 738 feet) extending along about 4000 feet of shoreline. This site has a capacity of approximately 550,000 cubic yards. It is anticipated that this site would be filled to about 60 percent capacity with the material dredged during the 2002 –2003 dredging activity.

2.1.1 Proposed Development.

Dredged material placement in 2002-2003 would occur in a manner that extends the shore riverward along the proposed reach in an effort to create an approximately 18 lineal acre planting bench for riparian species that would submerge within the water surface elevation range between 736 and 738 feet m.s.l. The Lower Granite reservoir maximum operating pool is elevation 738 feet m.s.l. and minimum operating pool is elevation 733 feet m.s.l. The overall plan is to place the sands in the below-water portion extending riverward of the riparian embankment. Riverward to the approx 18 lineal acre riparian bench, sand would be placed to enhance the rearing suitability of the mid-depth habitat bench by decreasing the depth at a 1 vertical to 10 horizontal slope across approx 16 acres of shallow water rearing habitat. Most of the riparian bench above 736 feet m.s.l. would be capped with silt. The outer slope would be at the angle of repose for the material placed (about 1 vertical to 10 horizontal), and shaped to form a relatively smooth surface. Cobbles from the dredging of the navigation lock approaches would be placed around the perimeter of the bench in a one-foot thick by approximately 30 feet wide band to cover the maximum fluctuation in pool elevation (between elevation 732 and 736; Plates FB-1 and FB-2). The cobbles would cover about ¼ to $^{1}/_{6}$ the total width of the shallow water habitat to provide armoring to protect the bench from wave action from the wind or passing barges/boats. Cobble placement would start at the upstream end of the bench where it would be tied into the existing shoreline. The riparian bench surface area would vary from about 150 feet to about 400 feet wide by 4,000 feet long. The final riparian bench surface would be left in an undulating condition to provide variable root zone conditions for final planting. Final shaping of the above-water surface and planting would occur by separate contract.

2.1.2 Placement Methods

The placement methods will be proposed by the Contractor, approved by the Corps, and may use a combination of four methods: bottom dumping from hopper barges, dozing the material from flat deck barges, hydraulic conveyance from a pump scow, and/or dragline.

Bottom dumping from hopper barges is the preferred placement method. It would result in the least release of turbidity, and would be the most efficient placement method (and least expensive). However, this method requires a water depth of about 8 to 10 feet, so use of this type placement method at this site

could be limited. One method employed to overcome water depth would be to bottom dump in deeper water and use a dragline to move the material into the desired position.

Dredged material dozed from a flat deck barge would be similar to bottom dumping. Turbidity may be slightly higher than a bottom dump barge because material would be shoved off the barge deck in several clumps, compared to one clump from a bottom dump. While water depth may still be an issue (about 6 foot depth required), the flat deck barge could reach somewhat shallower depths than a bottom dump barge. Moving the material a second time with a dragline would again be an option.

Hydraulic conveyance is a process of liquefying the dredged material and pumping to the desired discharge location. Depending on the material being pumped, the slurry would be about 80 percent water. This method does not have depth as a limiting factor because the slurry would be transported through a floating pipeline routinely repositioned, except that some form of underwater containment berm would need to be constructed using either bottom dumping or clamshell placement. Also, moving the floating discharge point pipeline would require a boat or crane. This method has the highest potential for turbidity and would likely require weirs between the shore and the containment berm to form cells to act as settling catchments and possibly silt fence deployment.

Dragline is a method that would employ a crane and bucket for excavation of material bottom-dumped in deeper water, then placed in its final location in the embankment. The dragline would be positioned to reach the dumped material, scoop it up and place it in the fill.

2.1.3 Placement Plan

The Corps of Engineers standard practice for contracting this type of work is to specify the environmental protection requirements and final design specifications that must be met by the contractor, but let the contractor determine the exact construction methods that would be used to meet the contract requirements. The contract for the 2002-2003 dredging will focus on requirements (ie turbidity level, work window, slope of underwater fill, placement of a silt cap) rather than placement methods to allow the contractor to be as innovative as possible. Prior to any work being performed in the field, the low bid

contractor will be required to submit their work execution plan, including how they intend to meet the environmental requirements. Until the contractor submits their plan, the exact placement method is undetermined.

The Corps has identified four possible placement scenarios: construction of earthen cells and hydraulic placement of material within the cell, silt curtain cells used with hydraulic placement, a combination of silt curtain and earth embankment with hydraulic placement, and placement using a bottom dump with clamshell or dragline. These are discussed below. In addition to these scenarios, it may be advantageous to raise and or lower the Lower Granite Pool during placement operations within the designated in-water work window. For example, a deeper pool would allow barge access closer to shore. Lowering the pool may facilitate placement of the silt cap on the riparian bench.

Scenario 1 – Construction of earthen cells and hydraulic placement within the cells. This method employs all of the placement methods described above. First, an earth berm would be constructed along the outer edge of the disposal area. This would be accomplished using dredged material placed by pushing material off flat deck barges or bottom dump scows. A floating dragline would be set up on the inside of the earth berm. Boats would be used to position the dragline. Once the berm was constructed to a depth that precluded placement from a flat deck barge or bottom dump scows, the dumps would be made outside of the berm. The dragline would be used to scoop the dumped material and place it on top of the berm. This would be repeated until the berm was above the water surface. Cross berms would be constructed using the dragline perpendicular to shore, between the shore and the berm. This would create containment cells. Once the containment cells were complete, all remaining dredged material would be placed hydraulically. Placement would begin at the upstream cell and work downstream. It is expected that the cells would contain any turbidity that might occur during placement. Materials used for the berm construction would be mostly sand with some gravels and cobbles intermixed. The fill inside the cells would be mostly sand up to just above the water surface. The shoreline portion of each cell, which defines the riparian bench, would then be capped with hydraulically placed silt from the recreation sites and ports.

Scenario 2 - Silt curtain cells used with hydraulic placement. This would be similar to Scenario 1, except the containment cells would be formed using a geotextile fabric draped to the river bottom to act as a silt barrier. The bottom

edge would be anchored if necessary. Material would be hydraulically placed within the geotextile containment cell. Placement would proceed until material within the cell was at the existing water surface. The geotextile fabric would be moved downstream and an adjacent cell would be similarly formed. This would continue for the length of the disposal area. Once the fill had been brought up to the water surface, the shoreline portion of each cell, which defined the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill and material would be placed hydraulically inside the silt fence.

Scenario 3 – Lower Granite pool would be raised to the maximum operating pool. Placement would be performed from flat deck barges or bottom dump scows as much as possible in the depth provided. Once the placement had reached an elevation that flat deck barges or bottom dump scows could no longer place their load, a silt curtain would be installed and a containment cell formed as discussed above. Dredged material would be placed hydraulically within the silt curtain. Once the platform within that cell reached the water surface, the silt curtain would be relocated to form the next cell. Once the fill had been brought to the water surface, the shoreline portion of each cell, which defined the riparian bench, would be capped with silt material from the dredging operations. A silt fence would be installed on the fill and silt would be placed hydraulically.

Scenario 4 - Placement using a dragline. Lower Granite pool would be raised to the maximum operating pool. A dragline would be used to dredge its way into shore, with the material side cast in the proposed disposal area. Flat deck barge or bottom dump scow placement would be performed as much as possible in the depth provided. As the bench is brought to the water surface, and depths are inadequate for dumping directly from the barge, the dumping would occur in the channel dredged by the dragline. After each dump, the dragline would excavate that material and place it in the fill. This would continue until a section of the bench was complete within the reach of the dragline. The silt cap would be similarly placed, once the riparian bench had been brought to the water surface. A silt containment structure such as a silt fence or other barrier may be needed to prevent effluent from re-entering the river.

2.1.4 Final Shaping

Some underwater grading and final shaping would be required by the dredging contractor once the bench and slope is completed. Shaping of the in-water slopes most likely would be by floating dragline. A boat-towed beam may also be used. Above-water surface shaping of the capped area would be by conventional grading equipment such as a dozer, rubber tired loader, or backhoe and would be performed sometime after the placement of the dredged material was complete. Some surface undulations would be desired to provide differing root zone conditions for the riparian species planted.

Once the final shaping of the shoreline was complete, the gravel and cobbles excavated from the navigation lock approaches would be placed around the perimeter of the bench to form a protective zone from erosion. This would likely be performed using a clamshell and a flat deck barge. The material would be brought by barge to the disposal site and the clamshell would lift the gravel and cobbles off the barge and place them in a band within the selected elevations along the shoreline. The gravel and cobble zone would be final shaped to a relatively smooth surface into the sand mixture to mimic a naturally formed, smooth, exposed sandbar.

2.1.5 Principle Environmental Concerns.

Water quality impacts and impacts to aquatic organisms, in particular Endangered Species Act-listed fish, are the principle environmental concerns with disposal of the dredged material. Water quality parameters that are most likely to be affected are turbidity and ammonia, and to a lesser degree pH, dissolved oxygen, and temperature. Disposal of the silt would have the greatest impact on water quality as the fine material would be suspended in a turbidity plume and would be more likely to contain any contaminants such as ammonia.

Aquatic organism concerns, other than those related to water quality, are the impacts to all fish during construction of the planting bench and the configuration of the submerged habitat once construction is complete. During construction, fish must not be trapped and covered with the dredged material. After construction, the underwater slopes must be gently sloping and fairly smooth to facilitate rearing by juvenile fall chinook without providing hiding cover for fish that prey upon the fall chinook.

3.0 ANALYSIS OF EFFECTS

3.1 Effects of the Proposed Action

The NMFS' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or Critical Habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 C.F.R.§ 402.02).

3.1.1 Direct Effects

Direct effects result from the agency action and include the effects of interrelated and interdependent actions. The primary change in short-term effects between the two proposed disposal sites is the longer duration of the handling of material at the Chief Timothy site than would have occurred with a bottom-dump operation at the Knoxway Canyon site. The primary long-term effects between the two proposed disposal sites are the amount and type of habitat affected. The pre-dam and pre-reservoir condition at both sites are quite similar in that both sites were upland tracts of land that already had agriculturally based developments (cattle, pasture, and orchards) and homesteads constructed between the original river bank and the base of the canyon walls. This evaluation is partially based upon 1992 aerial photography and site visits when Lower Granite reservoir was in a test drawdown exposing shorelines down 30+ vertical feet. Since impoundment, disposal would type-convert the Knoxway Canyon site from a relatively mid-depth of 20-30 feet with no to fair suitability for SRF chinook rearing up to a 10:1 slope of less than 20 feet at the riverward terminus edge with good to very good suitability for SRF chinook rearing based upon Bennett et al. (1997) criteria. In contrast, the Chief Timothy site is a fairly suitable site for SRF chinook rearing, only limited by silt substrate, not by depth. Although about ½ of the end product footprint would increase in suitability for SRF chinook rearing, this portion is in the steeper and deeper contours of less than fair suitability, whereas greater than ½ of the end product footprint acreage would be type-converted for riparian plantings thereby losing over 18 acres of currently available fair habitat. If riparian plantings are native species that grow successful enough along the new shoreline they could provide some additional volume and diversity of seasonal macroinvertebrate food items.

The direct effects of the proposed DMMP would result from activities that would commence during the 2002-2003 project phase. These activities include dredging which has been addressed in the BA and the change in the location of the in-water dredged material disposal. The primary direct effects of the disposal activities include (1) turbidity and (2) suspension of contaminants.

For salmonids, turbidity elicits a number of behavioral and physiological responses which indicate some level of stress (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985; Servizi and Martens 1992). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35-150 NTU) accelerate foraging rates among juvenile chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

Another area of uncertainty is how dredging or in-water disposal actually distributes contaminants. There should be no change from how material was handled in the original proposal for disposal at Knoxway Canyon site. The Corps has tested most sediments within the action area and determined that they would not, with the exception of silt-laden substrates, exceed existing regulatory thresholds for a range of contaminants.

There is a growing body of literature that suggests small amounts of certain contaminants may affect the biology of salmonids. The Corps has committed to conservation measures for the 2002-2003 dredging and disposal that minimize the exposure of listed salmonids to contaminants: (1) dredging and disposal activities will be conducted during the winter when listed salmonids are not abundant, (2) sediments will be sampled for contaminants and not disposed of in-water if contaminant levels exceed screening criteria as identified in the Lower Columbia River Dredged Material Evaluation Framework, (3) if the total amount of dredged material to disposed of in-water has more than 30% silt, the silt material that exceeds the 30% criteria will be disposed of in an upland site, (4) Best Management Practices would be implemented to prevent fuel spills, hydraulic leaks, etc. during dredging and disposal operations, and (5) scientific literature will be monitored to update/determine which chemicals adversely affect listed salmonids, at what concentrations the effects occur, and which means of sampling are most appropriate for specific contaminants.

3.1.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur (50 C.F.R. § 402.02). The primary

indirect effects of the DMMP that have not been addressed include only the alteration of nearshore and benthic habitat at the new Chief Timothy site.

Dredging would remove some quantity of benthic salmonid habitat. The proposed in-water disposal plan also has potential to create shallow-water benthic habitat. Aquatic invertebrates, particularly dipterans, are an important food item of juvenile chinook salmon and steelhead in the Lower Snake River (Bennett and Shrier 1986, Curet 1994).

The majority of dredging would focus on navigation lanes where oligachaetes and chironomids (dipterans) are the dominant invertebrates. These invertebrates are likely to be disturbance tolerant as their habitat is constantly modified by sediment accumulation and dredging. Post-dredging recolonization would likely occur rapidly through drifting and crawling from adjacent non-disturbed areas (e.g., Mackay 1992). Zimmerman and Rasmussen (1981) and Easterbrooks (1995-1998) found that chinook salmon also rear in some low velocity, vegetated backwater areas of the Columbia River (e.g., Casey Ponds).

To compensate for habitat impacts that may occur through dredging, the Corps proposes to construct nearshore rearing habitat through dredged material disposal. The goal of this habitat construction would be to mimic the shallow, sandy rearing conditions favored by some fall chinook juveniles (Bennett *et al.* 1997). This type of habitat has been successfully constructed following previous dredging operations (Bennett *et al.* 1997). The creation of rearing habitat with dredged materials is likely to replace habitat functions lost as a result of nearshore dredging activities. However, if dredged materials are disposed in areas with characteristics (e.g., flow rate and depth) that differ substantially from other successful habitat constructions sites, the benefits of habitat construction may be limited. In spring and summer 2002, the Corps began monitoring of new disposal/ habitat creation and reference sites to clearify if expected benefits to listed salmonids would accrue.

The majority of non-contaminated dredged materials will be used along the immediate upriver shore of Chief Timothy State Park for creating shoreline habitat for planting a riparian buffer between the river and the highway to Clarkston, WA. About half of the fill would result in creation of nearshore habitat for SRF chinook within the lower Granite Reservoir. Juvenile

SRF chinook are often associated with shallow, sandy nearshore areas (Bennett *et al.* 1997). This habitat has been identified to be the preferred rearing habitat type within the impounded Snake River. The Corps will use sand obtained through dredging to fill portions of the river and, therefore, mimic the shallow sandy habitat used by rearing SRF chinook. The Corps has identified several sites in Lower Granite reservoir where rearing habitat could be created. The sites were identified because they are on the inside of a river bend, have suitable water velocities and underwater contours to facilitate habitat creation, and they are configured so the dredged material can be deposited without burying known cultural resource sites.

The Corps would use adaptive management for the dredging activities covered under the DMMP/EIS. As new issues arise including, but not limited to, water chemistry issues, dredging technique improvements, ESA status of anadromous fish, or scientific findings related to material disposal locations, dredging and disposal techniques may need to be revisited based on findings. In addition, the Corps understands that major unforeseen developments may require reinitializing consultation with NMFS.

Disposal of dredged material for beneficial use, e.g. habitat restoration, is an adaptive management and somewhat experimental approach that has been based on results derived from sound scientific investigation and monitoring. Approximately 10 years of study targeting the restoration of critical components of salmon habitat with dredged material was conducted in the lower Snake River by the University of Idaho and their cooperators beginning in about 1986 (Bennett et al. 1997, etc.). These studies were directed through a multi-agency coordinating committee who principally learned that the best in-water use of the available natural substrate material of predominately sand was the re-establishment of shallow water open sand for the rearing and feeding of juvenile subyearling chinook salmon. The Corps, along with various other agencies and interest groups, believes that beneficial use of dredged material, specifically salmonid habitat restoration/creation, should be viewed as an adaptive management technique. Biological and physical monitoring of the newly created

habitats should be conducted not only for the primary species of interest (in this case fall chinook), but also for predatory fish, prey items and other species which may be positively or negatively impacted (e.g. Pacific lamprey). Since the completion of the University of Idaho studies, the regional salmon community has

been further educated on the importance of the identified juvenile salmon habitat components to the stock's overall production and the effects of warming water associated with shallow open water and sandy areas on juvenile SRF chinook salmon individual growth rates and production (Annex D, Appendix M, ACOE 2002). Such research and monitoring that occurred by the University of Idaho beginning in 1986 (Bennett and Shrier 1986) has been re-instituted in the summer of 2002 in follow-up to gauge whether the beneficial trend for fall chinook attraction and rearing documented at Centennial Island (RM 120) continues past 10 years and to document the baseline conditions of the proposed disposal sites of Knoxway Canyon (RM 116) and Chief Timothy (RM 132) prior to any placement of material as currently designed.

3.2 Effects on Critical Habitat

The NMFS designates Critical Habitat for a listed species based upon physical and biological features that are essential to that species. Essential features of Critical Habitat for endangered SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SRB steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (65 Fed. Reg.7764, February 16, 2000).

There should be no significant change in effects on Critical Habitat due to the change from disposal proposed originally at Knoxway Canyon to the new site at Chief Timothy. The direct and indirect effects listed previously include some discussion of impacts to Critical Habitat. Overall, the DMMP would cause transient impacts to Critical Habitat during the 2002-2003 project operations shifting the estimated effects from Knoxway Canyon to Chief Timothy. The new disposal site and design should result in a more positive long-term effect on SRF chinook salmon production based upon the close proximity of the Chief Timothy site to the highly utilized rearing site immediately upriver at Wilma.

The DMMP conservation measures, monitoring, studies and adaptive management strategy would prevent long-term impacts to the essential features

of Critical Habitat. Consequently, the two elements of the DMMP (2002-2003 project operations and 20-year conceptual plan) would not adversely modify the Critical Habitat of SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SRB steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead.

4.0 ADDITIONAL AREAS OF CONCERN

4.1 Federal Columbia River Power System (FCRPS) Biological Opinion (BO)

On December 21, 2000, NMFS issued the FCRPS BO (NMFS 2000), which serves as the Environmental baseline for which most actions such as the DMMP and Woody Riparian programs would be compared and measured for determination of effects. The FCRPS BO (NMFS 2000) found that the FCRPS jeopardizes the continued existence and survival of endangered SR sockeye, threatened SRF chinook, threatened SRSS chinook, threatened SRB steelhead, endangered UCRS chinook, endangered UCR steelhead, and threatened MCR steelhead ESUs. To avoid jeopardy, Federal agencies regulating the FCRPS were provided a number of Reasonable and Prudent Alternatives (RPAs). In the RPAs, NMFS identified four categories of actions where survival and recovery of listed salmonids may be enhanced: hydroelectric, habitat, harvest, and hatcheries. It is important to note that a number of the RPAs involve off-site mitigation (e.g., habitat improvements in estuaries and mainstem tributaries): modifying hydroelectric actions alone is insufficient to avoid jeopardy, habitat improvement are also necessary. Creation or restoration of critical components of habitat such as shallow water rearing habitat for SRF chinook salmon with disposal of dredged material provides positive contribution to this RPA of the FCRPS BO.

4.2 Magnuson-Stevens Fishery Conservation and Management Act

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

The Corps does not disagree with NMFS belief that the proposed action may adversely impact designated EFH for chinook salmon. NMFS determined in their DRAFT BO that the originally proposed action may result in detrimental

short- and long-term impacts to a variety of habitat parameters. This determination would not change for the modification of the new proposed disposal site. These adverse effects are: (1) turbidity resulting from in-water disposal of dredged materials which may increase in duration and concentration within the zone of dispersion if hydraulic placement of material is the selected method by the Corps Contractor, (2) mobilization of contaminated sediments into the water column, and (3) displacement and loss of approximately 18 acres of benthic habitat.

Pursuant to Section 305(b)(4)(A) of the Magnuson-Stevens Act (50 CFR 600), NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NMFS understands that the conservation measures described in the BO will be implemented by the ACOE, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. However, the Reasonable and Prudent Measures and the Terms and Conditions outlined in Section VII are generally applicable to designated EFH for Pacific salmon and address these adverse effects. Consequently, NMFS recommended that they be adopted as EFH conservation measures. If implemented by the Corps, these measures will minimize the potential adverse impacts of the proposed project and conserve EFH.

4.2 Land Use and Shoreline Development

The action area is affected by a range of land uses and varying levels of shoreline development. Crop-land, marinas, docks, residential dwellings, roads, railroads, rip-rap, and landscaping have displaced natural habitat features. In terms of the MPI, this land use and shoreline development has primarily affected the Habitat Elements and Channel Condition and Dynamics pathways. In general, shoreline development has reduced the quality of nearshore salmonid

habitat by eliminating native riparian vegetation, (contributing to the *not properly functioning* status for Large Woody Debris and Refugia indicators); displacing shallow water habitat with fill materials (contributing to the *not properly functioning* status for the Off-Channel Habitat indicator); and by further disconnecting the Snake and Columbia Rivers from historic floodplain areas (contributing to the *not properly functioning* status for the Floodplain Connectivity indicator). Additionally, agricultural land use (e.g., grazing, growing crops, irrigating) has reduced the quality of riparian buffers and the stability of soils adjacent to rivers and streams. Without adequate buffers and effective soil stabilization, sediments are easily eroded and transported to surface waters where they accumulate (sedimentation). Although smaller tributaries may be affected initially, erosion and sedimentation ultimately affect mainstem portions of the Snake and Columbia Rivers.

5.0 CONCLUSION

The Corps has determined that the change in disposal site, design, and methods of placement addressed in this Addendum B could have substantial differences in the functional response of ESA-listed salmonids related to seasonal habitat use. Our determination of "*may affect, likely to adversely effect*" has not changed, and the proposed modified action would be implemented under the same Reasonable and Prudent Measures and Terms and Conditions resulting from NMFS consultation. The change in disposal site should result in more positive production of SRF chinook based upon the most recent scientific information. The Chief Timothy site is more adjacent to Wilma, where Bennett et al. (1997) has sampled the highest use of rearing juvenile SRF chinook salmon. However, the Chief Timothy site currently has limited salmonid use data in which to indicate its degree of use or importance to the overall population production. Although the site has positive habitat attributes for rearing in shallow depth, it is limited by a covering of silt. The Corps would only allow the proposed disposal plan to be implemented at this site following this spring and summer monitoring designed to indicate if the site is currently utilized by SRF chinook or other listed salmonid stock by a high degree.

NMFS determined in a Draft BO that the effects of the originally proposed dredge removal with disposal at Knoxway Canyon would not jeopardize the continued existence of endangered SR sockeye, threatened SRF chinook,

threatened SRSS chinook, threatened SRB steelhead, endangered UCRS chinook, endangered UCR steelhead, or threatened MCR steelhead or result in the adverse modification or destruction of their Critical Habitat. The determination of no jeopardy is based upon the current status of the species, the environmental baseline for the action area, and the effects of the proposed actions.

The new disposal site would not degrade baseline habitat functions necessary for the survival and recovery of any of the subject species identified herein. Directly, the actions are consistent with the DMMP framework consulted upon causing transitory turbidity and could increase the probability of injury or death of an undeterminable number of individual salmonids through entrainment, but these effects will not affect long-term baseline habitat functions or population production.

Indirectly, the new disposal strategy at Chief Timothy is likely to displace some benthic habitat, but the Corps will replace the functions lost by creating new and better suitable shallow water rearing habitat. This type of mitigation has been used previously by the Corps under informal consultation through NMFS and fall chinook were shown to utilize it.

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DREDGED MATERIAL MANAGEMENT PLAN
AND ENVIRONMENTAL IMPACT STATEMENT

McNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

ADDENDUM A TO THE BIOLOGICAL ASSESSMENT
PROVIDED TO THE NATIONAL MARINE FISHERIES SERVICE

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EXECUTIVE SUMMARY

This addendum to the Biological Assessment (BA) for the Dredged Material Management Plan and Environmental Impact Statement (DMMP/EIS) for McNary and the Lower Snake River Reservoirs is in response to a meeting held between personnel from the Walla Walla District of the U.S. Army Corps of Engineers and the National Marine Fisheries Service (NMFS) on August 28, 2001. This addendum is meant to address deficiencies, provide clarification, and provide additional information in the BA that was received by the Lacey, Washington, NMFS office on July 9, 2001.

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TABLE

1.0 INTRODUCTION

On August 28, 2001, staff from the Walla Walla District Corps of Engineers (the Corps) attended a meeting (The Meeting) with the National Marine Fisheries Service (NMFS) to address the Biological Assessment (BA) for the Dredged Material Management Plan and Environmental Impact Statement (DMMP/EIS) for McNary and Lower Snake River Reservoirs, received by NMFS on July 9, 2001. According to NMFS, the BA appeared sound but was found to have some minor deficiencies, required clarification of certain objectives, and was in need of minor changes in the language of specific actions affecting Endangered Species Act- (ESA-) listed threatened and endangered anadromous fish occurring in the project area. In addition, items discussed in a supplemental letter prepared by the Corps and sent on July 27, 2001, (The Letter) needed minor clarification.

It was decided that an addendum to the BA and The Letter would suffice for revisions, additions, and answers to questions that were posed by NMFS at the meeting. Subjects covered in the addendum should include changes to the BA and The Letter, clarification of dredging and disposal operations for the 20-year plan, how to address the impacts of ammonia while dredging and disposing, NMFS additional areas of concern, and when the Corps might expect to receive the final Biological Opinion (BO).

2.0 CHANGES TO THE BIOLOGICAL ASSESSMENT

This section will address the requests for change of content and clarification of certain portions of the BA.

2.1 Dredging Activities

This consultation includes all dredging occurring in pre-existing locations that require removal of accumulated sediment. New locations including boat basins, irrigation intakes, port areas, or access channels that might be created by dredging activities would require separate ESA consultations.

As addressed in The Letter, plate 17 in the DMMP/EIS shows the full extent of dredging options that were considered in the DMMP/EIS for the Snake and Clearwater Rivers confluence area. However, the preferred alternative is only for maintenance dredging of the navigation channel, the area designated in solid red, not the area outlined by the hatched pattern. The Corps does not expect to conduct conveyance dredging or to dredge beyond the limits of the navigation channel other than in port areas and recreation facilities in this area over the 20-year course of the DMMP/EIS. Thus, it follows that the port of Wilma, a known fall chinook salmon rearing area, is not expected to be disturbed. It is understood that, should any dredging be proposed by the Corps for the rearing area at the port of Wilma, a separate consultation would be required.

NOTE: A set of plates (N-2 through N-14) that outline the dredging areas proposed for FY 2003 are referenced in this addendum and included as part of Appendix N (DREDGING PROPOSED FOR WINTER 2002-2003).

2.2 Coordination

On page F-5 of the BA, it states, "Consultation with NMFS in 2001 will be for the 20-year conceptual plan and for the 2002-2003 activities. Subsequent consultations will be aimed at covering 5-year increments. For example, consultation in 2003 could cover dredging activities for 2004-2009." The NMFS indicated that consultations needed to occur on a yearly basis rather than on a 5-year basis as proposed. The Corps acknowledged this schedule and asked about the format of the annual correspondence. The NMFS responded that the documentation might consist of a few pages containing information regarding what dredging-related activities were performed in the previous year and what were planned for the upcoming year. Activities to be addressed would include, but not be limited to, dredging locations and volumes, monitoring activities and results, and data collection and analysis results as recommended by possible Reasonable and Prudent Measures (RPM's) included in the BO. Correspondence would be conducted by June 1 of each year with expected response from NMFS by July 15.

On page F-27 and subsequent pages of the BA, the anticipated dredging activities are outlined for fiscal year 2003 (FY 03). As of September 1, 2001, the following dredging operations are not expected to occur during FY 03: item 5 - Joso Barge Slip Construction, item 6 - Little Goose Pool at Shultz Bar, and item 7 - Boise Cascade. Because Joso is not being considered for construction in time for the first year of dredging, any material unsuitable for in-water disposal would have to be taken to an upland disposal area yet to be determined.

It is anticipated that the Corps would use adaptive management for the dredging activities covered under the DMMP/EIS. As new issues arise including, but not limited to, water chemistry issues, dredging technique improvements, ESA status of anadromous fish, or scientific findings related to material disposal locations, dredging and disposal techniques may need to be revisited based on findings. In addition, the Corps understands that major unforeseen developments may require reinitializing consultation with NMFS.

In The Letter, it was stated, "the Corps plans to conduct underwater surveys of the approaches to the navigation locks prior to dredging these areas. If one or fewer redds were found in a proposed dredging area, dredging would commence as scheduled." At the request of NMFS, language regarding the attention to redds should be changed. The Corps acknowledges that if one or more redds were found in a proposed dredging area, consultation with NMFS would be held prior to commencing dredging activities. After consultation, the Corps would determine if dredging would resume at that location.

3.0 CLARIFICATION OF THE 20-YEAR PLAN

Many sites will require dredging on an average 2-year cycle; however, dredging frequencies are dependent on variable sedimentation rates and cycles may actually vary from 2 to 10 years. Some areas noted on plates 1 through 17, however, have not been dredged since their construction, indicating a possible 25-year cycle for dredging those areas.

Dredging activities vary drastically by location. Dredging could consist of merely "clearing off the high points" in the navigation channel or approaches to boat basins, complete dredging of

boat basins to the original template, or partial excavation of boat basins to simply allow safe navigation. A survey of areas anticipated for dredging will occur on an annual basis throughout the 20-year life of the DMMP. Surveys will be conducted using acoustic and/or mechanical sounding devices to determine volume of sediment accrued and the need for dredging each area.

3.1 Navigation Channel Maintenance Dredging and Disposal

For the dredging proposed for the navigation channels, slips, and berths of the Columbia/Snake/ Clearwater Rivers navigation system, mechanical dredging would be used, probably using a clamshell. Material would be scooped from the river bottom and loaded onto either a bottom-dump barge for in-water disposal or a bin-type barge for upland disposal. For the Federal navigation channel, dredging quantities are based on maintaining the dredging template. The dredging template is based on the authorized navigation channel configuration of 250 feet [76.2 meters (m)] wide and 14 feet (4.3 m) deep as measured at minimum reservoir level. To maintain the authorized depth, the Corps typically allows a contractor to overdredge by up to 2 feet (0.6 m), resulting in a channel up to 16 feet (4.9 m) deep. This additional depth typically reduces the frequency of dredging activities.

The barge would then be pushed by a tug to the disposal site. No material or water would be discharged from the barge while in transit. If the disposal location were an in-water site, once the barge arrived, the bottom would be opened to dump the material all at once. If the disposal location were an upland site, the barge would be unloaded using mechanical equipment. Once unloaded, the barge would be returned to the dredging site for additional loads.

3.2 Backwater Dredging and Disposal

Techniques for dredging backwater areas are varied. In the past, hydraulic and mechanical methods have been used depending on the depth of the basin and the accessibility of equipment into the area. There are currently no dredging templates for the recreation sites and wildlife Habitat Management Units (HMU's).

3.2.1 Swim Beaches

In the past, the Swallows Swim Beach has typically been dredged using a backhoe stationed on the shore. Dredging has typically yielded no more than 4 feet (1.2 m) of water depth upon completion. Dredged material was typically stockpiled on the shore and then transferred to a truck by which it was taken to an upland disposal site. Similar dredging and disposal methods and depth requirements are anticipated to be used in the future.

3.2.2 Boat Basins

Dredging and disposal methods for boat basins may be accomplished by a variety of means. The Corps anticipates that the deeper boat basins may be dredged using a clamshell. Smaller basins that may not allow access of large equipment may be dredged using a backhoe operating from either the shore or a barge or both. Dredging in the boat basins would typically restore the

original design contours and depths to the original river bottom or to no greater than 8 feet (2.4 m) of depth after excavation.

If dredging operations occur in the winter and if the sediments were not contaminated, dredged material would most likely be placed in a bottom-dump barge and disposed of in-water unless other beneficial uses were found. Most of the material from boat basins is anticipated to be silt and would probably be used along with sand to create the base layer of shallow-water fish habitat at the in-water disposal sites. If material were contaminated, it would be deposited either in a bin-type barge or truck and disposed of at an appropriate upland disposal site. If dredging were to occur during periods of warm water, the same equipment would be used; however, material would be deposited either on shore for removal by truck or into a bin-type barge and transferred to an upland disposal location. No in-water disposal would occur during summer dredging.

3.2.3 Irrigation Intakes

Dredging around the HMU irrigation intakes would re-establish the zone of open water around the intakes necessary for efficient operation. Because most of these areas are relatively shallow, using larger equipment (including clamshells) would not be a viable method. Dredging of these areas would be accomplished using either hydraulic dredging or a backhoe operating from either the shore or barge or both. All disposal of material at the HMU's is expected to occur upland on Corps property on lands immediately surrounding the irrigation intake; however, if conflicts with management of the HMU's arise, upland disposal at other locations may be required.

3.3 Specific Dredging Actions for FY 03 Dredging Activities

As reported in the BA on page F-27, the following areas will be dredged for the FY 03 dredging operations. Please note the removal of items 5, 6, and 7 as mentioned in section 2.2 of this addendum. Also note that the quantities have been revised to reflect the most recent survey data available.

Table F-5 (revised). Sites Proposed for Dredging in FY 03 and the Estimated Quantities for Each.

Site Number	Site to be Dredged	Quantity to be Dredged (cy)
1	Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	250,500
2a	Port of Clarkston	9,600
2b	Port of Lewiston	5,100
3a	Hells Canyon Resort Marina	3,600
3b	Greenbelt Boat Basin	2,800
3c	Swallows Swim Beach/Boat Basin	16,000
3d	Lower Granite Dam Navigation Lock Approach	4,000
3e	Lower Monumental Dam Navigation Lock Approach	20,000
4a	Illia Boat Launch	1,400
4b	Willow Landing Boat Launch	6,200
4c	Hollebeke HMU Irrigation Intake	3,300
	TOTAL	**322,500**

3.3.1 Site 1 - Federal Navigation Channel at the Confluence of the Snake and Clearwater Rivers

The Corps anticipates dredging up to 250,500 cubic yards (cy) [191,521.0 cubic meters (m^3)] of material from the Federal navigation channel at the confluence of the Snake and Clearwater Rivers in the winter of FY 03. Dredging would be aimed at restoring the navigation channel to a depth of no more than 16 feet (4.9 m) in the area designated in plate N-2. Dredging has occurred in this area since 1985 and conveyance dredging [dredging that includes not only the navigation channel, but areas outside the navigation channel as well (historically, up to 1,300 feet (396.24 m) in total width) in an attempt to enlarge the river cross section and increase the flow conveyance capacity of the river in that reach] was done in 1988, 1989, and 1992. Sediment surveys in June 2000 discovered that 85 to 90 percent of the substrate at this location was sand and 10 to 15 percent was silt and/or organic material. Dredging this area is expected to remove approximately 197.5 surface acres (79.9 hectares) of sandy shallow water habitat.

Bennett (1998) reported that juvenile fall chinook salmon in Lower Granite reservoir prefer sandy substrates, but typically along shorelines. Most dredging in this area will avoid the shoreline areas; therefore, in-water sites known to provide rearing habitat for fall chinook salmon (e.g., Port of Wilma) would not be disturbed. Long-term negative impacts to habitat used by threatened and endangered salmonids, including rearing, migratory, and overwintering behavior, would not be anticipated at this dredging location.

3.3.2 Site 2a - Port of Clarkston

The Corps anticipates dredging up to 9,600 cy (7,339.7 m^3) of material from the Port of Clarkston in the winter of FY 03. Dredging would be aimed at restoring the port to a depth of no more than 16 feet (4.9 m) in the area designated on plate N-3. Dredging has occurred in this area since 1982 and it was last dredged in 1998. Sediment surveys in June 2000 discovered that sediment composition was more than 90 percent silt. Dredging at this location is expected to remove 0.9 acre (0.4 hectare) of shallow water silt habitat.

Bennett (1998) reported that juvenile fall chinook salmon in Lower Granite reservoir prefer sandy substrates. The location of the port on the reservoir is such that it is a place that continually collects silt. Although Easterbrooks (1995-1998) found some chinook salmon overwintering in backwater areas of the Columbia River, dredging this area is not expected to have short- or long-term deleterious consequences to endangered fish habitat.

3.3.3 Site 2b - Port of Lewiston

The Corps anticipates dredging up to 5,100 cy (3,899.2 m^3) of material from the Port of Lewiston in the winter of FY 03. Dredging would be aimed at restoring the port to a depth of no more than 16 feet (4.9 m) in the area designated on plate N-4. Dredging has occurred in this area since 1982 and it was last dredged in 1998. Sediment surveys in June 2000 discovered that sediment composition was 90 percent silt. Dredging at this location is expected to remove 1.8 acres (0.7 hectare) of shallow-water silt habitat.

Bennett (1998) reported that juvenile fall chinook salmon in Lower Granite reservoir prefer sandy substrates. The location of this port on the reservoir is such that it is a place that continually collects silt. Although Easterbrooks (1995-1998) found some chinook salmon overwintering in backwater areas of the Columbia River, dredging this area is not expected to have short- or long-term deleterious consequences to endangered fish habitat.

3.3.4 Site 3a - Hells Canyon Resort Marina

The Corps anticipates dredging up to 3,600 cy (2,752.4 m^3) of material from the Hells Canyon Resort Marina in FY 03. Dredging would be aimed at restoring the marina to a depth of no more than 10 feet (3.0 m) in the area designated on plate N-5. Dredging has occurred in this area since 1975 and may have been dredged last in 1986. Sediment surveys in June 2000 discovered that sediment composition was 56 to 67 percent sand and 21 to 27 percent silt. Dredging at this location is expected to remove 0.6 acre (0.2 hectare) of shallow-water silt and sand habitat.

The impacts of dredging in this location on habitat for threatened and endangered anadromous salmonids are not known. Most species of salmonids are not expected to use this area for rearing although Easterbrooks (1995-1998) found some chinook salmon overwintering in backwater areas of the Columbia River. Other than rearing habitat that may be removed by dredging this area, dredging activity is not expected to have short- or long-term deleterious consequences to threatened and endangered fish habitat.

3.3.5 Site 3b - Greenbelt Boat Basin

The Corps anticipates dredging up to 2,800 cy (2,140.8 m^3) of material from the Greenbelt Boat Basin in FY 03. Dredging would be aimed at restoring the basin to a depth of no more than 7 feet (2.1 m) in the area designated on plate N-6. Dredging has occurred in this basin since 1975 and it was last dredged in 1998. Sediment surveys in June 2000 discovered that sediment composition was 45 percent sand and 35 percent silt. Although the template in plate 23 shows that up to 33.3 acres (13.5 hectares) of shallow-water sand and silt habitat would be removed, construction blueprints show that all dredging would occur no farther than 25 yards (22.9 m) from shore and within 175 yards (160.0 m) downstream of the boat basin. Total acreage to be dredged is closer to 1 acre (0.4 hectare).

With the closely correlated ratios of silt to sand, the value of this habitat for rearing salmonids is not known. Some winter rearing habitat would probably be removed by dredging this area.

3.3.6 Site 3c - Swallows Swim Beach/Boat Basin

The Corps anticipates dredging up to 16,000 cy (12,232.9 m^3) of material from the Swallows Swim Beach and Boat Basin in FY 03. Dredging would be aimed at restoring the basin to a depth of no more than 8 feet (2.4 m) and the swim beach to a depth of no more than 5 feet (1.5 m) in the template outlined on plate N-7. Dredging has occurred in this area since 1975 and it was last dredged in 1999. Sediment surveys in June 2000 discovered that sediment composition was 56 to 67 percent sand and 21 to 27 percent silt. Dredging at this location is expected to remove no more than 2.2 acres (0.9 hectare) of shallow-water sand and silt habitat.

With the closely correlated ratios of silt to sand, the value of this habitat for rearing salmonids is not known. Some winter rearing habitat would probably be removed by dredging this area.

3.3.7 Site 3d - Lower Granite Dam Navigation Lock Approach

The Corps anticipates dredging up to 4,000 cy (3,058.2 m^3) of material from the Lower Granite Dam Navigation Lock Approach in FY 03. Dredging would be aimed at restoring the navigation channel to a depth of no more than 16 feet (4.9 m) in the area designated on plate N-8. Dredging has occurred in this area since 1975 and it was last dredged in 1998. Sediment surveys in June 2000 discovered that sediment composition was large rock substrate and 1- to 6-inch [2.5- to 15.2-centimeter (cm)] cobbles. Dredging at this location is expected to remove 31.0 acres (12.5 hectares) of shallow-water rock and cobble habitat.

Although adult fall chinook salmon have the potential to spawn in the existing navigation channel, no spawning is anticipated based on lower velocities in this area. However, NMFS has proposed pre-dredge surveys of the area to ensure that no redds are disturbed.

3.3.8 Site 3e - Lower Monumental Dam Navigation Lock Approach

The Corps anticipates dredging up to 20,000 cy (15,291.1 m^3) of material from the Lower Monumental Dam Navigation Lock Approach in FY 03. Dredging would be aimed at restoring the navigation channel to a depth of no more than 16 feet (4.9 m) in the area designated on plate N-9. Dredging has occurred in this area since 1972 and it was last dredged in 1999. Sediment surveys in June 2000 discovered that sediment composition was large rock substrate and 1- to 6-inch (2.5- to 15.2-cm) cobbles. Dredging at this location is expected to remove 14.7 acres (5.9 hectares) of shallow-water rock and cobble habitat.

Although adult fall chinook salmon have the potential to spawn in the existing navigation channel, no spawning is anticipated based on lower velocities in this area. However, NMFS has proposed pre-dredge surveys of the area to ensure that no redds are disturbed.

3.3.9 Site 4a - Illia Boat Launch

The Corps anticipates dredging up to 1,400 cy (1,070.4 m^3) of material from the Illia Boat Launch in FY 03. Dredging would be aimed at restoring the basin to a depth of no more than 8 feet (2.4 m) in the area designated on plate N-10. Dredging has never occurred at this boat launch. Sediment surveys in June 1997 discovered that sediment composition was 86 to 95 percent silt and 5 to 14 percent sand. Dredging at this location is expected to remove 1.0 acre (0.4 hectare) of shallow water silt habitat.

3.3.10 Site 4b - Willow Landing Boat Launch

The Corps anticipates dredging up to 6,200 cy (4,740.2 m^3)] of material from the Willow Landing Boat Launch in FY 03. Dredging would be aimed at restoring the basin to a depth of no more than 8 feet (2.4 m) in the area designated on plate N-11. Dredging has never occurred at this boat launch. Sediment surveys in June 2000 discovered that sediment composition was 56 to

67 percent sand and 21 to 27 percent silt. Dredging at this location is expected to remove 1.4 acres (0.6 hectare) of shallow-water sand and silt habitat.

Bennett (1998) reported that juvenile fall chinook salmon in Lower Granite reservoir prefer sandy substrates. The location of this launch is such that it continually collects silt. Dredging this area is not expected to have either short- or long-term deleterious consequences to endangered fish habitat.

3.3.11 Site 4c - Hollebeke HMU Irrigation Intake

The Corps anticipates dredging up to 3,300 cy (2,523.0 m^3) of material from the Hollebeke HMU Irrigation Intake in FY 03. Dredging would be aimed at restoring the basin and access channel to a depth of no more than 7 feet (2.1 m) in the area designated on plate N-12. Other than very minor hydraulic dredging around the intake pipe itself, dredging has never occurred at this facility. Sediment surveys in June 2000 discovered that sediment composition was 56 to 67 percent sand and 21 to 27 percent silt. Dredging at this location is expected to remove 2.7 acres (1.1 hectares) of shallow-water sand and silt habitat.

With the closely correlated ratios of silt to sand, the value of this habitat for rearing salmonids is not known. Some winter rearing habitat would probably be removed by dredging this area.

4.0 AMMONIA

Ammonia and its effects on the aquatic environment are issues of increasing concern. The effect of ammonia on aquatic animals in the laboratory is well documented but, in large water bodies (like the Snake and Columbia Rivers), little is actually known. However, concerns about ammonia and the effects of dredging will vary depending on dredging location within the reservoirs. Because ammonia is typically higher in sedimentary materials composed of silt and lowest in areas containing cobble, gravel or sand, ammonia is not expected to be an issue in many of the dredging locations.

4.1 Dredging in Areas of Low to No Silt Substrate

The Snake and Clearwater Rivers confluence, Shultz Bar, and the tailraces of the dams typically contain substrates of either greater than 75 percent sand or are made up of cobble and gravel--substrates not conducive to high ammonia levels. Therefore, monitoring for ammonia at these dredging and disposal locations would be conducted in a similar manner as to monitoring for turbidity. Water quality monitors outfitted with ammonia probes and turbidity monitors (as well as other water quality measuring probes) would be positioned 109.4 yards (100 m) upstream and downstream of the dredging operations. In addition, an array downstream of buoys downstream from the dredging area is anticipated with monitors at 218.8 and possibly 547 yards (200 and 500 m) downstream. The dredging and disposal activity would be monitored to determine if ammonia levels were exceeded, similar to the turbidity monitoring. If the concentrations of ammonia were found to be high, modification of the dredging operations would occur in a manner similar to those outlined for turbidity. Additional monitors may need to be installed downstream, however, to determine the persistence of ammonia in the water column and mixing

zones. If altering of the dredging or disposal activity were determined to have no effect on lowering the concentration of ammonia, the contractor would cease operations and consult with the Corps regarding how to proceed.

4.2 Dredging in Areas of Predominantly Silt Substrate

Sedimentary materials in backwater areas are typically composed of silt. Silt has a higher potential to bind with ammonia, causing greater concern for the toxicity of the aquatic environment when dredging and disposing of this material. Adaptive management for ammonia monitoring, dredging operations in these areas, and disposal of the material will be required.

Mechanical dredging of backwater areas (e.g., boat basins) may be done during both the winter and/or summer. Monitoring for ammonia at the dredge site would initially be performed using a minimum of three water quality monitors in four key zones of each individual site. Depending on the size of the site, one or more monitors would be strategically positioned inside the area to be dredged. The second zone would contain at least one monitor in the opening of the backwater area to determine if ammonia levels were entering the main river. The third zone would be in the main river downstream from the entrance of the backwater area to determine potential concentrations and dispersal as mixing of water from the main stem and backwater occurs and the fourth zone would be a monitor upstream from the boat basin, used as a control. If the concentrations of ammonia were found to be high, modification of the dredging operations would occur. Such modifications may include a slower dredging operation to reduce total turbidity and ammonia release, or possibly a physical barrier across the opening of the backwater to minimize release of turbidity and/or unwanted chemicals into the river.

Disposal operations would be monitored for ammonia in a manner similar to the turbidity monitoring. However, the need for monitoring downstream of the disposal area may require more monitors to determine mixing zone effects both closer and farther away from the disposal site. At least three zones would be strategically monitored. The first would be approximately 109.4 yards (100 m) upstream from the planned disposal site, and the second and third would be within the expected turbidity plume to measure the ammonia concentrations at distances of 109.4 and 328.2 yards (100 and 300 m) from the release site. If the concentrations of ammonia exceed allowable limits, the contractor would be required to modify the disposal activity. If altering the dredging or disposal activity were determined to have no effect on lowering the concentration of ammonia, the contractor would cease operations and consult with the Corps regarding how to proceed.

Hydraulically dredging backwater areas in the summer would not be expected to cause problems with ammonia. Hydraulic dredging would essentially vacuum silt from the irrigation intake areas and deposit water and material upland. Any ammonia release might occur as runoff from the land, but these effects are expected to be minimal. Monitoring for ammonia would be similar to that mentioned for mechanical dredging, but none is expected for disposal.

5.0 THE NMFS ADDITIONAL AREAS OF CONCERN

At The Meeting, NMFS identified the following issues that they feel will require additional investigations to determine the effect of dredging/disposal on listed species. Some of this information would be required prior to a dredging operation while some would be gathered over multiple years of dredging to provide input to the adaptive management process.

5.1 Sediment Deposition

Reckendorf, 1989, reported that most sedimentary materials deposited in the Lower Granite reservoir came from both agricultural and forest practices farther upstream in the Clearwater, Grande Ronde, and Salmon River Basins. The NMFS believes that if better farming and forest management practices were used upstream, dredging the confluence area of the Snake and Clearwater Rivers would be required less often, thus reducing environmental impacts of dredging and disposal. Unfortunately, Reckendorf's study was performed in 1985 and land management practices within the basin may have changed since that time. The NMFS would like to see the Reckendorf report updated with investigations into the current sources of sedimentation and the potential effects on endangered species in the project area.

If this analysis were undertaken, the goal would be to determine causes and origins of sediment that is being deposited into the project area. The NMFS would like to use the resulting information to create a basis for future corrective actions (sediment reduction plan) by various agencies within the federal government. However, it is outside the Corps' authority to implement programs aimed at changing land management practices on lands outside the Corps' project boundaries. Consequently, the Corps has not programmed funds in the FY 02 or FY 03 operation and maintenance budget to perform the analysis required to update the Reckendorf study.

5.2 Fish Habitat - Disposal Areas

In the late 1980's to early 1990's, biological investigations were conducted in the Lower Granite reservoir to study the effects of in-water disposal on habitat use by various species of anadromous and non-anadromous fish. Although research showed a benefit for endangered salmonids, no recent studies have been conducted to determine the continued and long-term viability of these sites as beneficial to endangered salmonids. The NMFS would like to know the current status of the biological and physical integrity and benefits of the original shallow-water disposal sites as well as that of any newly created sites.

5.3 Fish Habitat - Backwater Areas

From 1995 to 1998, Easterbrooks found juvenile anadromous fish using backwater areas of the McNary reservoir, specifically in Casey Pond, during the proposed yearly in-water work window. Primarily because of his findings, the Corps made a determination of "likely to adversely affect" most ESA-listed fish that seasonally occur in the areas proposed for dredging. The question was then raised by NMFS of how endangered fish may be using backwater areas of the lower Snake River and how dredging these areas may be affecting the habitat use by

endangered salmonids. The NMFS has indicated they would like to have the results of further investigations into the seasonal use of boat basins and backwater areas by endangered anadromous salmonids, and how dredging these areas may affect the habitat.

5.4 Fish Habitat - Spawning Areas

Underwater video surveys by Battelle have documented that limited spawning sporadically occurs downstream from the dams in the near tailrace areas. Although no fish are expected to be spawning in the barge approach channels due to low velocities, NMFS is still concerned because of this potential and may request surveys of these areas prior to any dredging operations.

In addition, sediment surveys have indicated that the substrate to be removed is primarily cobble, which may be suitable for fall chinook salmon spawning. The NMFS is interested in the feasibility of using cobbles excavated from the navigation channels to create fall chinook salmon spawning habitat in the tailraces of the dams. The investigation of artificial spawning channels may be warranted.

5.5 Fish Entrainment

Although clamshells, backhoes, and limited hydraulic dredging techniques are not expected to entrain fish, the possibility does exist. Currently, there is no formal plan to monitor for entrained fish or redds at any of the dredging locations. The NMFS has indicated that they would be concerned if dredging/disposal took place without periodically sampling the dredged material to determine potential impacts to ESA-listed threatened or endangered species.

5.6 Sediment and Water Quality Analysis

The NMFS would encourage water quality monitoring during dredging (e.g., turbidity, pH, temperature, ammonia) and sediment contaminant monitoring. Areas that have not been tested recently or are of unknown quality should be monitored for specific toxic substances or indicator compounds. Again, this testing would probably include ammonia.

6.0 ISSUANCE OF THE BO

In discussions at The Meeting, we requested an estimate for the date that the Corps might receive both the draft and final BO's. The NMFS believed that the draft BA would be out no later than January 1, 2002, and that the final BA would come out no later than March 1, 2002.

7.0 PLATES

Plates N-2 through N-12 in appendix N (DREDGING PROPOSED FOR WINTER 2002-2003) detail the templates for the areas proposed for dredging in FY 03.

8.0 REFERENCES

Reckendorf, Frank, and Paul Pedone. 1989. Erosion and Sediment Impacts of the 1985 Food Security Act Above the Lower Granite Reservoir, Idaho, Oregon, and Washington. Proceedings of National Nonpoint Source Conference. 1989.

Easterbrooks, J. 1995, 1996, 1997, 1998. Memorandums to R. Dennis Hudson summarizing annual Casey Pond fish sampling. Washington Department of Fish and Wildlife, Yakima Screen Shop, Yakima, Washington.

DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

McNARY AND LOWER SNAKE RIVER RESERVOIRS

APPENDIX F

BIOLOGICAL ASSESSMENT FOR ANADROMOUS FISH SPECIES

U.S. Army Corps of Engineers
Walla Walla District
201 N. 3rd Avenue
Walla Walla, WA 99362

In Compliance with the Requirements of the Endangered Species Act

June 2001

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1.0 INTRODUCTION

The Walla Walla District Corps of Engineers (Corps) is proposing to conduct navigation and maintenance dredging on the lower Snake River, mid-Columbia River (specifically McNary reservoir), and at the mouth of the Clearwater River. The proposed activities, which would occur in the states of Oregon, Washington, and Idaho, are detailed in the Walla Walla District Dredged Material Management Plan and Environmental Impact Statement (DMMP/EIS) (USACE and EPA, 2001). These activities include dredging, dredged material disposal, and raising of levees. These activities would occur over a 20-year period from the date the Record of Decision (ROD) is signed, at sites associated with four dams operated by the Corps on the lower Snake River and McNary Lock and Dam (McNary) on the mid-Columbia River. The purpose of the dredging is to restore the authorized depth of the navigation channel, remove sediment from port areas, provide for recreational use, and provide for irrigation of wildlife habitat and recreation sites.

As part of the environmental review process, the Corps is conducting assessments of the potential impacts of project actions to species listed under the Endangered Species Act (ESA). For the purposes of this Biological Assessment (BA), only anadromous fish species are evaluated. The Corps has identified seven federally listed species that occur or may occur in the project vicinity. These included: Snake River sockeye salmon (*Oncorhynchus nerka*), Snake River fall chinook salmon (*O. tshawytscha*), Snake River spring/summer chinook salmon (*O. tshawytscha*), Upper Columbia River spring-run chinook salmon (*O. tshawytscha*), Snake River basin steelhead (*O. mykiss*), Middle Columbia River steelhead (*O. mykiss*), and Upper Columbia River steelhead (*O. mykiss*). The lower Snake River supports a limited population of bull trout (*Salvelinus fontinalis*) on a seasonal basis and the Corps recognizes the potential for this species to exist in the anadromous form. The BA for bull trout, however, is discussed in the BA to the U.S. Fish and Wildlife Service (USFWS). In addition, two anadromous species of concern may be found in the project area. These include Pacific lamprey (*Lampetra tridentata*) and white sturgeon (*Acipenser transmontanus*).

2.0 PROJECT DESCRIPTION

2.1 Background and Purpose

The Corps is authorized by the River and Harbor Act of 1945 (Public Law 79-14) to maintain a navigation system on the lower Snake and Columbia Rivers. The portion of the navigation system within the Walla Walla District includes five reservoirs: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs on the lower Snake River, spanning the region from the Tri-Cities, Washington, east to Lewiston, Idaho; and McNary reservoir on the Columbia River between Umatilla, Oregon, and the Tri-Cities, Washington (plate 1 - NOTE: Plates without an "F-" designation are from the main DMMP/EIS report). These reservoirs are part of the Columbia/Snake River inland navigation waterway, which provides slackwater navigation from the mouth of the Columbia River near Astoria, Oregon, to port facilities on the Snake and Clearwater Rivers at Lewiston, Idaho, and Clarkston, Washington. Each of these reservoirs requires some level of dredging on a periodic basis to maintain the navigation channel at the minimum authorized depth of 14 feet [4.3 meters (m)].

The Corps also maintains recreation facilities and irrigated wildlife habitat management units (HMU's) as part of the lock and dam projects. The HMU's are designated areas where the Corps has made vegetative improvements to provide habitat for various birds, mammals, reptiles, amphibians, and native plants. Often, these areas require irrigation to maintain the improved vegetation. The irrigation intakes at the wildlife HMU's and some recreation sites require periodic dredging to remove sediment that clogs the pumps. The boat launch facilities and swimming beaches at the recreation sites also periodically require dredging to remove accumulated sediment that reduces water depth and interferes with recreational use.

There are five locks and dams on the portion of the Columbia and Snake River navigation project in the study area: McNary, Ice Harbor Lock and Dam (Ice Harbor), Lower Monumental Lock and Dam (Lower Monumental), Little Goose Lock and Dam (Little Goose), and Lower Granite Lock and Dam (Lower Granite) (plate 1). Each of these projects is authorized to provide navigation facilities including locks with dimensions of 86 feet (26.2 m) wide and over 665 feet (202.7 m) long to allow passage of a tug and four-barge tow commonly used in river navigation. Construction of these dams has created a series of slackwater reservoirs on the Snake and Columbia Rivers, adding an additional 179 miles [288.1 kilometers (km)] to the Columbia/Snake Rivers shallow-draft inland navigation system. This navigation system has resulted in a significant shift in the economy of eastern Washington as new inland ports have become established to handle the needs of barge shippers. Wheat, barley, wood chips, and other wood products are the primary commerce bound downstream from this region with petroleum and fertilizer the principal commerce bound upstream. These shipments depend on the availability of a navigation system that provides a 14-foot (4.3-m) draft channel for barge tows.

Lower Granite, the most upstream of the four lower Snake River dams, receives a large sediment load from a drainage area that includes the upper Snake, Salmon, Grande Ronde, Imnaha, and Clearwater Rivers. The upper reach of the Lower Granite reservoir serves as a sediment trap for most of the material carried in suspension in the free-flowing reaches of the contributing rivers. The quantity of sediment that collects in the Lower Granite reservoir exceeds the quantities observed in each of the other lower Snake River reservoirs and in the McNary reservoir.

The Lower Granite project includes levees as appurtenant facilities of the authorized project to allow normal operating water surfaces of 733 to 738 feet above mean sea level (msl) in the Lewiston and Clarkston areas. The backwater levees constructed around Lewiston were designed to protect the city from inundation during the occurrence of a Standard Project Flood (SPF) of 420,000 cubic feet per second (cfs) [11,893.1 cubic meters per second (m^3/s)].

A history of dredging in the Walla Walla District is shown in table F-1. Although several proposed dredging locations have been dredged since salmon stocks were first listed under the ESA, the National Marine Fisheries Service (NMFS) and other agencies believe that a longer-term project would have negative impacts on listed species that may still exist in the project area during the established in-water work window. These species may include an unknown number of juvenile Snake River fall chinook salmon and Snake River Basin or Middle Columbia River Basin steelhead. The Corps last dredged the Snake/Clearwater Rivers confluence area and Lower Granite navigation lock approach in 1997-1998, and the Lower Monumental navigation lock approach in 1998-1999. Both times, the Corps used in-water disposal very similar to what

is proposed for the DMMP/EIS. Both times, the Corps made a "*May Affect, But Not Likely To Adversely Affect*" determination that the NMFS' Snake River Basin Habitat Office in Boise, Idaho, concurred with. The Corps believes that a primary concern during recent consultations is modification to Critical Habitat for listed steelhead. Concerns include adults that may still be migrating in the early winter, kelts that may be moving through the confluence area, or pre-smolts that may be overwintering. A small population of juvenile fall chinook salmon that have not out-migrated as subyearlings and spring/summer chinook may also be overwintering in the vicinity of the proposed dredging area as indicated by passive integrated transponder (PIT)-tag data back to 1995 and spring seining data back to 1991 (Bennett et al. 1999), as well as surveys in backwaters of the McNary reservoir (Easterbrooks, 1995, 1996, 1997, 1998). Concerns addressing cobble removal from the two navigation lock approaches and effects of sediment remobilization on water quality can be avoided based on pre-project spawning surveys performed in the tailwaters of the lower Snake River dams (Dauble et al., 1998) accompanied with monitoring performed while dredging. Methods and technologies designed to detect and avoid or minimize negative effects that the Corps has not considered would be welcomed as recommended criteria from NMFS through Formal Consultation.

Table F-1. History of Dredging in Lower Snake River and McNary Reservoirs.

Dredge Location	Year	Purpose	Amount Dredged (CY)	Disposal
Excavation of Navigation Channel Ice Harbor Lock and Dam Part I and II, Channel Construction	1961	Navigation	3,309,500	Unavailable
Navigation Channel Ice Harbor Lock and Dam Part III, Channel Construction	1962	Navigation	120,000	Unavailable
Downstream Navigation Channel Ice Harbor Lock and Dam	1972	Navigation	80,000	Unavailable
Downstream Approach Navigation Channel Lower Monumental Lock and Dam	1972	Navigation	25,000	Unavailable
Navigation Channel Downstream of Ice Harbor Lock and Dam	1973	Navigation	185,000	Unavailable
Downstream Approach Channel Construction Lower Monumental Lock	1977	Navigation	10,000	Unavailable
Downstream Approach Channel Construction Ice Harbor Lock	1978	Navigation	110,000	Unavailable
Downstream Approach Channel Construction Ice Harbor Lock	1978/ 81/82	Navigation	816,814	Unavailable
Recreation Areas (Corps)	1975 – Present	Recreation	20,000	Upland Sites
Clearwater River Port of Lewiston Area (Corps)	1982	Navigation/ Maintain Flow Conveyance Capacity	256,175	Upland Sites

Table F-1. History of Dredging in Lower Snake River and McNary Reservoirs (continued).

Dredge Location	Year	Purpose	Amount Dredged (CY)	Disposal
Port of Clarkston (Port)	1982	Navigation	5,000	Upland Site
Downstream Approach Channel Construction Ice Harbor Lock	1985	Navigation	98,826	In-Water
Snake/Clearwater Rivers Confluence Area (Corps)	1985	Maintain Flow Conveyance Capacity	771,002	Wilma HMU
Port of Lewiston (Corps)	1986	Navigation/ Maintain Flow Conveyance Capacity	378,000	Upland Sites
Snake/Clearwater Rivers Confluence Area (Corps)	1988	Maintain Flow Conveyance Capacity	915,970	In-Water
Snake/Clearwater Rivers Confluence Area (Corps)	1989	Maintain Flow Conveyance Capacity	993,445	In-Water
Schultz Bar (Corps)	1990	Navigation	27,335	NA
Snake/Clearwater Rivers Confluence Area (Corps)	1992	Maintain Flow Conveyance Capacity	520,695	In-Water
Ports of Lewiston, Almota, and Walla Walla	1991/92	Navigation	90,741	Unavailable
Boise Cascade	1992	Navigation	120,742	In-Water
Port of Kennewick	1993	Navigation	6,130	NA
Schultz Bar (Corps)	1995	Navigation	14,100	In-Water
Snake/Clearwater Rivers Confluence Area (Corps)	1996/97	Navigation	68,701	In-Water
Snake/Clearwater Rivers Confluence Area (Corps)	1997/98	Navigation	215,205	In-Water
Greenbelt Boat Basin Clarkston	1997/98	Navigation	5,601	In-Water
Port of Lewiston (Port)	1997/98	Navigation	3,687	In-Water
Port of Clarkston (Port)	1997/98	Navigation	12,154	In-Water
Lower Granite Navigation Lock Approach	1997/98	Navigation	2,805	In-Water
Lower Monumental Navigation Lock Approach	1998/99	Navigation	5,483	In-Water
Source: USFWS, August 1998/Corps, July 19, 1995, and September 2, 1999.				

In anticipation of future sediment problems and projected volumes of dredged material, the Walla Walla District has prepared a DMMP/EIS to provide long-range planning for the management of dredged material. The purpose of the DMMP/EIS is threefold:

a) To evaluate alternative programs to maintain the authorized navigation channel and certain publicly owned facilities in the lower Snake River and McNary reservoirs for the next 20 years.

b) To evaluate alternative measures to maintain flow conveyance of the Lower Granite reservoir for the remaining economic life of the project (through 2074).

c) To evaluate alternative programs of managing dredged material in a cost effective, environmentally acceptable, and, wherever possible, beneficial manner.

2.2 The BA and Section 7 Consultation

This BA is programmatic in nature, addressing the preferred conceptual plan for dredging and disposal actions that would take place over the next 20 years. It also contains detailed information on dredging and disposal activities planned to take place during the first year only (2002-2003). Consultation with NMFS in 2001 will be for the 20-year conceptual plan and for the 2002-2003 activities. Subsequent consultations will be aimed at covering 5-year increments. For example, consultation in 2003 could cover dredging activities for 2004-2009.

2.3 Preferred Alternative

Following a screening process that evaluated dredging from minimal amounts up to 2 million cubic yards (CY) (1,529,110 m^3) per year, levee raises from 0 to 12 feet (0 to 3.7 m), and in-water or upland disposal, the Corps selected a preferred alternative from four that were screened as best addressing the purpose and need of the DMMP/EIS.

The main components of the preferred alternative are:

- Conduct maintenance dredging of navigation-related facilities on an as-needed basis (2- to 5-year average) in each of five reservoirs on the lower Snake and Columbia Rivers.

- Conduct maintenance dredging on an as-needed basis around public recreation areas and wildlife HMU's on the lower Snake and Columbia Rivers.

- Dispose of dredged material primarily through beneficial activities coordinated with the Local Sediment Management Group (LSMG).

- Dispose of any dredged material unsuitable for beneficial uses at an upland site.

- Maintain flow conveyance capacity of the Lower Granite reservoir by raising the west Lewiston Levee by as much as 3 feet where needed.

2.4 Dredging Methods and Timing

The dredging procedure to be used varies depending on the location of the dredging (table F-2).

Table F-2. Dredging Options by Area.

Area to be Dredged	Dredging Option*		
	Time of Year to Dredge	Method of Dredging	Disposal Location
Navigation Channel	Winter	Mechanical	In water or upland
Ports	Winter	Mechanical	In water or upland
Boat Basins	Winter or summer	Mechanical	In water or upland
Swim Beach	Summer or winter	Mechanical	Upland or in water
Irrigation Intakes	Summer or winter	Mechanical or hydraulic	Upland for hydraulic, either for mechanical

* Options listed in order of preference

For the dredging proposed for the navigation channels, slips, and berths of the Columbia/Snake/ Clearwater Rivers navigation system, mechanical dredging would be used. Mechanical dredging methods would include clamshell, dragline, backhoe, or shovel/scoop. Based on previous dredging activities, the clamshell method would probably be used for the larger quantities. Material would be scooped from the river bottom and loaded onto a bottom-dump barge for in-water disposal or a bin-type barge for upland disposal. The contractor would be allowed to overspill excess water from the barge while the barge is being loaded. The water would be discharged a minimum of 2 feet (0.6 m) below the river surface. Clamshell dredges of approximately 15-CY (11.5-m^3) capacity and barges with a capacity of up to 3,000 CY (2,293.7 m^3) with maximum drafts of 14 feet (4.3 m) would be used. The Corps estimates it could take about 6 to 8 hours to fill a barge. The expected rate of dredging is 3,000 to 5,000 CY (2,293.7 to 3,822.8 m^3) per 8-hour shift. The barge would then be pushed by a tug to the disposal site. No material or water would be discharged from the barge while in transit. If the disposal location were an in-water site, once the barge arrived, the bottom would be opened to dump the material all at once. If the disposal location were an upland site, the barge would be unloaded using mechanical equipment. Once unloaded, the barge would be returned to the dredging site for additional loads.

The contractor could be expected to work between 10 and 24 hours per day, 6 to 7 days per week. Dredging in the navigation channels, slips, and berths would be performed within the established in-water work window (currently December 15 through March 1 in the Snake and Clearwater Rivers and December 1 to March 31 in the Columbia River). Multiple-shift dredging workdays would be used when necessary to ensure that dredging was completed within these windows.

Maintenance of irrigation intakes and beaches has often required small quantity dredging [less than 5,000 CY (3,822.8 m^3)]. Small quantity dredging projects may involve either mechanical or hydraulic dredging methods. While hydraulic dredging is generally not preferred, it may be necessary where mechanical equipment could cause damage to intake structures. A limited

amount of non-agitation, suction-type hydraulic dredging would be considered on a case-by-case basis in these off-channel areas. In such cases, mitigation measures would be required to minimize impacts to fish. These may include operating only during allowable temperature windows [i.e., when water temperature is above 70 °F (21 °C), the maximum to support salmonids] or use of exclusion devices, such as bubble curtains, to keep fish from entering the hydraulic pump.

Small project dredging would include discharging to a barge or truck for transport. If a truck were used, disposal of the material would be made on an appropriate upland site. Appropriate upland disposal sites include, but are not limited to, Corps land, beneficial-use upland applications, and local landfills. This small quantity dredging activity would use the in-water work window or possibly an alternate work window at another time during the year if one were approved for the specific project. All warm water and hydraulic dredging activities would require upland disposal of material.

2.5 Dredging Locations and Quantities

Following are descriptions of dredging activities anticipated in each of the five reservoirs in this system. The dredging areas described and depicted on plates 1 through 17 are the locations that the Corps anticipates may be dredged in the 20-year period of the DMMP/EIS. Many of the areas shown on the plates are not considered to need maintenance dredging in the near future; however, additional sites may be identified as needs arise.

2.5.1 Lower Granite Reservoir

Maintenance dredging in the Lower Granite reservoir may be done at several sites (plates 15 through 17). The largest concentration of dredging would be at the confluence of the Snake and Clearwater Rivers in the Clarkston/Lewiston area (plate 17). The area that requires frequent dredging extends from the vicinity of Silcott Island near Snake River Mile (RM) 131 upstream to the U.S. 12 bridge located near Snake RM 139.5 and from the confluence at RM 139 up the Clearwater River to just downstream of Memorial Bridge at RM 2, as shown on plate 17. Other than port areas, boat basins, and HMU irrigation intakes, dredging in the confluence area will be confined to the Federal navigation channel to minimize impacts to existing salmonid habitat. The Federal navigation channel extends to within 50 feet (15.2m) of existing port structures and the Corps is responsible for maintaining this channel. The port areas parallel the Federal channel and the ports are responsible for maintaining the port areas and the access from the Federal channel. The Ports have expressed interest in entering into an agreement for the Corps to dredge these areas.

Other areas in the Lower Granite reservoir that may require dredging at some time over the next 20-year period include: Port of Wilma slip; Port of Clarkston on the Snake River; Port of Lewiston on the Clearwater River; Green Belt Boat Basin; Potlatch Corporation dock; Hells Gate State Park moorage; Swallows Park boat basin and swimming beach, Chief Looking Glass Park moorage; Hells Canyon Resort marina; and the irrigation intake for Chief Timothy HMU (plate 17).

2.5.2 Little Goose Reservoir

Maintenance dredging in the Little Goose reservoir would include the Federal navigation channel downstream of the Lower Granite navigation lock guidewall and the Federal channel opposite Schultz Bar, RM 101.5 (plates 12 through 15). Dredging may also be required to maintain navigation facility clearances at the Port of Garfield, Port of Central Ferry, Port of Almota, and Boyer Park Marina. In addition, small dredging projects of 5,000 CY (3,822.8 m^3) or less may be required at the irrigation intakes of the Ridpath, New York Bar, Willow Bar, and Swift Bar HMU's over the 20-year period.

2.5.3 Lower Monumental Reservoir

Periodic dredging may be required to maintain adequate navigation clearances into Little Goose navigation lock and at Lyons Ferry State Park (plates 10 through 12). Small dredging projects may also be required to maintain the irrigation intakes for Skookum and 55 Mile HMU's.

2.5.4 Ice Harbor Reservoir

Maintenance dredging is required periodically for the Lower Monumental navigation lock approach channel and may be required to provide navigation clearances at Walla Walla Grain Growers at Sheffler, Louis Dreyfus Windust Station, and Charbonneau Park boat moorage (plates 8 through 10). Small amounts of dredging may be required periodically to maintain the irrigation intake for the Big Flat, Lost Island, and Hollebeke HMU's.

2.5.5 McNary Reservoir

Navigation maintenance dredging is required in the downstream approach channel to Ice Harbor navigation lock for a length of approximately 7 miles (11.3 km) (plates 2 through 8). Periodic dredging may also be required at Port of Umatilla; Port of Benton barge slip; Port of Pasco marine terminal, barge slip, and container terminal; Port of Walla Walla facilities; and Pasco Boat Basin.

2.5.6 Dredging Quantities

Most sites will require dredging on an average 2-year cycle; however, dredging frequencies are dependent on variable sedimentation rates and actual dredging cycles may vary from 2 to 10 years. Estimated dredging cycles and dredged material volumes for the lower Snake River and McNary reservoirs are presented in table F-3.

For the Federal navigation channel, dredging quantities are based on maintaining the dredging template. The dredging template is based on the authorized navigation channel configuration, which is 250 feet (76.2 m) wide and 14 feet (4.3 m) deep as measured at minimum reservoir level. To maintain the authorized depth, the Corps typically allows a contractor to overdredge by up to 2 feet (0.6 m), resulting in a channel up to 16 feet (4.9 m) deep. This additional depth reduces the frequency at which the Corps needs to dredge to maintain the channel. There is no

need to maintain a channel deeper than 16 feet (4.9 m) since the depth at the sills of the navigation locks is 15 feet (4.6 m).

Table F-3. Estimated Dredging Cycles and Material Volumes Per Cycle.

Reservoir	Estimated Dredging Cycle (years)	Estimated Maximum Volume of Dredged Material (CY)
Lower Granite	2	300,000
Little Goose	2	4,000
Lower Monumental	2	2,000
Ice Harbor	2	2,000
McNary	2	32,000

There are no dredging templates for the recreation sites and wildlife HMU's. Dredging in the boat basins would restore the original design contours and depths of the boat basins. Dredging around the irrigation intakes would re-establish the zone of open water around the intakes necessary for efficient operation of the intakes.

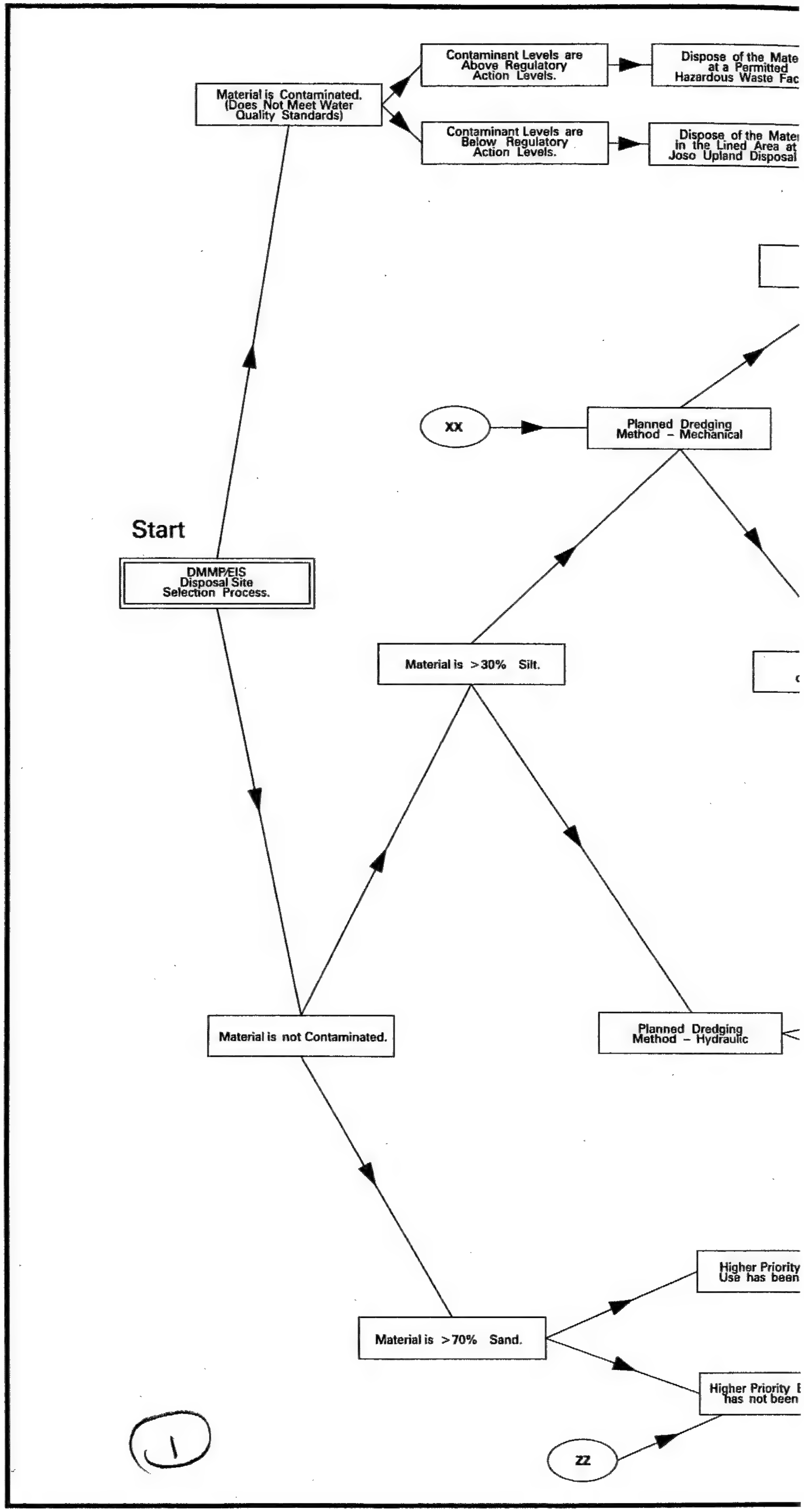
2.6 Dredged Material Disposal

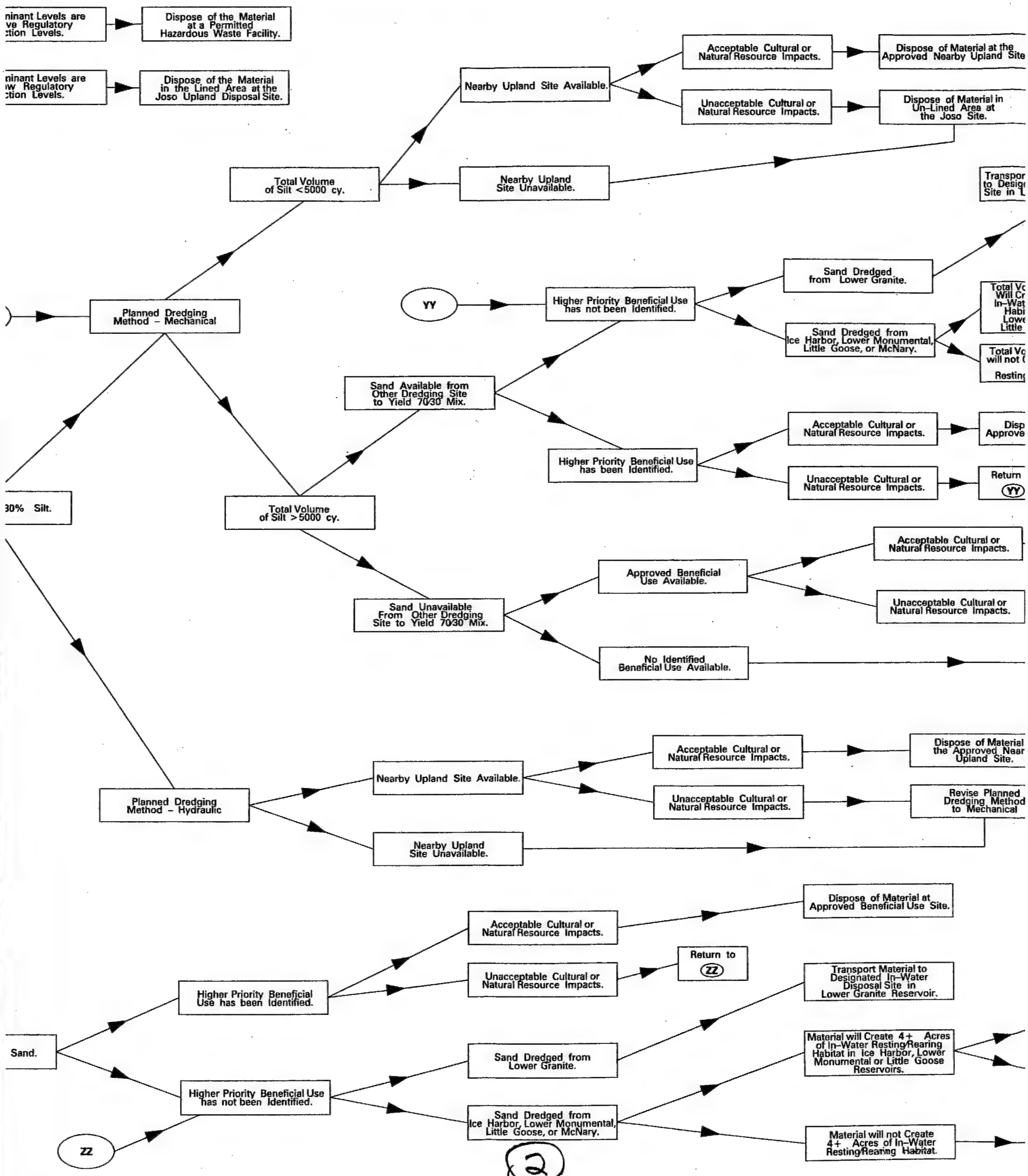
Dredged material will be disposed of primarily through beneficial uses. The dredged material can be used beneficially as fill in many different circumstances. When no beneficial uses are available or when sediments are found to contain unacceptable levels of contaminants, upland disposal will be used. Refer to the decision tree presented in figure F-1 for the determination of the method and location of dredged material disposal.

2.6.1 Beneficial Uses

Dredged material can be used to benefit and restore the environment. This use is consistent with Corps policy to secure the maximum practicable benefits through the use of material dredged from navigation channels. Opportunities to use dredged material beneficially often become available over time and cannot be anticipated in a programmatic document such as this. In order to be able to take advantage of such beneficial uses, this document sets forth a process to identify and evaluate the opportunities as each major dredging activity is being planned. Part of this process is the formation of an LSMG. An LSMG has been formed, consisting of Federal and state agencies including United States Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), USFWS, NMFS, and several others, as well as tribes, local ports, counties, and municipalities.

The LSMG would provide an interagency approach to management of dredged material including definition of disposal plans coordinated with and amenable to the public stakeholders and resource agencies. In accomplishing this function, the LSMG would facilitate a process involving participation of affected agencies, organizations, and groups to identify the most environmentally sound and practical beneficial use of dredged material for each major dredging activity. This group would help identify beneficial uses such as creation of aquatic and wildlife habitat, replenishment of beaches, or filling of upland commercial sites.


Start
DMMP/EIS Disposal Site Selection Process.
Material is Contaminated. (Does Not Meet Water Quality Standards)
Contaminant Levels are Above Regulatory Action Levels.
Dispose of the Mate at a Permitted Hazardous Waste Fac
Contaminant Levels are Below Regulatory Action Levels.
Dispose of the Mate in the Lined Area at Joso Upland Disposal
XX
Planned Dredging Method – Mechanical
Material is >30% Silt.
Material is not Contaminated.
Planned Dredging Method – Hydraulic
Material is >70% Sand.
Higher Priority Use has been
Higher Priority has not been
ZZ
1



ninant Levels are
ve Regulatory
tion Levels.
Dispose of the Material at a Permitted Hazardous Waste Facility.
ninant Levels are
w Regulatory
tion Levels.
Dispose of the Material in the Lined Area at the Joso Upland Disposal Site.
Acceptable Cultural or Natural Resource Impacts.
Dispose of Material at the Approved Nearby Upland Site
Nearby Upland Site Available.
Unacceptable Cultural or Natural Resource Impacts.
Dispose of Material in Un-Lined Area at the Joso Site.
Total Volume of Silt <5000 cy.
Nearby Upland Site Unavailable.
Sand Dredged from Lower Granite.
YY
Higher Priority Beneficial Use has not been Identified.
Planned Dredging Method – Mechanical
Sand Dredged from Ice Harbor, Lower Monumental, Little Goose, or McNary.
Sand Available from Other Dredging Site to Yield 70/30 Mix.
Acceptable Cultural or Natural Resource Impacts.
Higher Priority Beneficial Use has been Identified.
Unacceptable Cultural or Natural Resource Impacts.
Return
YY
30% Silt.
Total Volume of Silt >5000 cy.
Acceptable Cultural or Natural Resource Impacts.
Approved Beneficial Use Available.
Unacceptable Cultural or Natural Resource Impacts.
Sand Unavailable From Other Dredging Site to Yield 70/30 Mix.
No Identified Beneficial Use Available.
Acceptable Cultural or Natural Resource Impacts.
Dispose of Material the Approved Near Upland Site.
Nearby Upland Site Available.
Planned Dredging Method – Hydraulic
Unacceptable Cultural or Natural Resource Impacts.
Revise Planned Dredging Method to Mechanical
Nearby Upland Site Unavailable.
Dispose of Material at Approved Beneficial Use Site.
Acceptable Cultural or Natural Resource Impacts.
Return to
ZZ
Unacceptable Cultural or Natural Resource Impacts.
Higher Priority Beneficial Use has been Identified.
Transport Material to Designated In-Water Disposal Site in Lower Granite Reservoir.
Material will Create 4+ Acres of In-Water Resting/Rearing Habitat in Ice Harbor, Lower Monumental or Little Goose Reservoirs.
Sand.
Sand Dredged from Lower Granite.
Higher Priority Beneficial Use has not been Identified.
Sand Dredged from Ice Harbor, Lower Monumental, Little Goose, or McNary.
ZZ
Material will not Create 4+ Acres of In-Water Resting/Rearing Habitat.
2

DISPOSAL SITE SELECTION DECISION TREE

DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

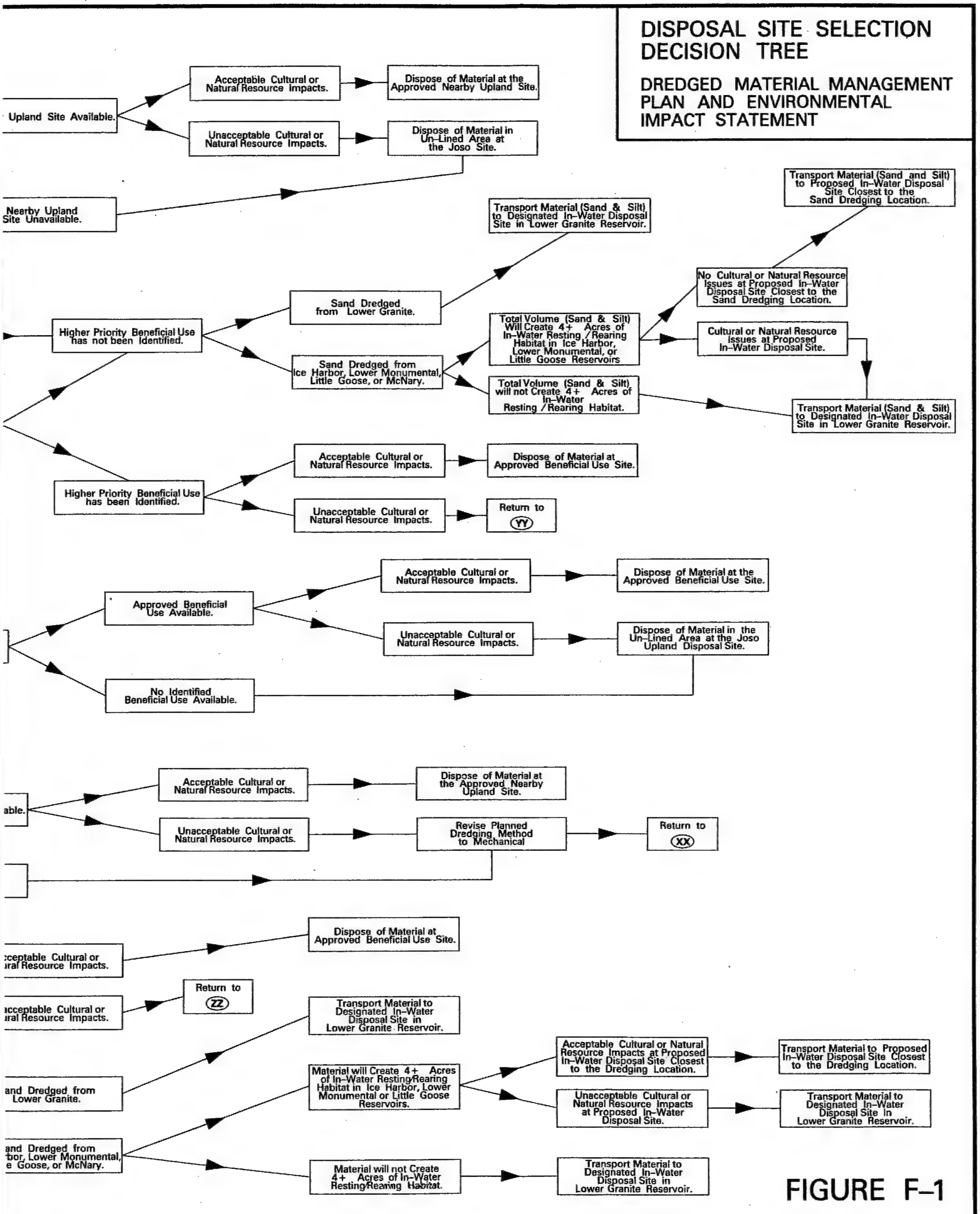


FIGURE F–1

Each time a dredging activity is planned, the following steps would occur:

- A notice would be sent to parties such as the Ports, municipalities, environmental groups, agencies, and others known to have an interest in the beneficial use of dredged material. The notice would provide the location, estimated quantity, dredging method, expected characteristics of dredged material and estimated time of the dredging activity. The notice would precede the proposed dredging activity by several months to allow time to negotiate an agreement with a local sponsor for the beneficial use of the dredged material.

- A public notice would be published prior to the dredging activity.

- A cultural resources report would be prepared for each dredging activity.

Potential beneficial uses that have been identified to date include:

- Fish Habitat Creation.

- Hanford Site Capping (federal).

- Potting Soil (business).

- Riparian Habitat Restoration.

- Port of Wilma Fill.

- Fill of Non-Federal Public Land.

- Highway or Road Construction.

These opportunities are described in detail in Section 2.5.4 of the DMMP/EIS.

Initially, the Corps' preferred beneficial use is in-water disposal to create shallow water fish habitat; however, during the life of the DMMP/EIS, beneficial uses will be prioritized depending on the potential uses available at the time. Juvenile fall chinook salmon prefer shallow, open sandy areas along shorelines for rearing (Bennett et al., 1997). Bennett et al. (1997) showed that fall chinook salmon used the shallow water habitat created with in-water disposal of dredged material that surrounds Centennial Island in Lower Granite reservoir near RM 120. In some years, as many as 10 percent of the total sample of subyearling chinook salmon from Lower Granite reservoir originated from the habitat created by in-water disposal. Bennett et al. (1997) reported that fall chinook salmon were most commonly collected over lower gradient shorelines that have low velocities and sandy substrate. Habitat having these physical characteristics can be effectively constructed in any of the lower Snake River reservoirs with appropriate placement of dredged material.

The disposal process is dependent on the physical characteristics of the material and the potential to optimize the benefit to fisheries. Dredged materials would be composed mostly of sediments containing a mixture of silts, sands, gravels, and cobbles carried by inflowing waters as suspended and bedload material. Sediment samples would be taken from the areas to be dredged and would be evaluated for particle size, contaminant levels, and suitability for in-water disposal. Particle size analysis would identify which dredging sites or portions of sites contain mostly silt and which ones contain mostly sand or coarser material. Based on previous experience, 85 percent of the material is expected to be sands [grains greater than 0.008 inch (0.2 millimeter (mm)) in diameter], gravels and cobbles and 15 percent of the material is expected to be silts and finer grained material.

The sequence of dredged material disposal for the majority of the dredging activities is designed to accomplish two goals: (a) create shallow water habitat for juvenile salmon and (b) dispose of silt in a beneficial manner. To meet these goals, the dredged material would be placed in steps. The first step would be to use the silt [less than 0.008 inch (0.2 mm) in diameter] in a mixture with sand and gravel/cobble to fill the mid-depth portion of a site and form a base embankment (figure F-2). The dredged material would be placed aboard bottom dump barges and analyzed to determine the percentage of sand or silt to ensure the mixture in the embankment was not more than 30 percent silt. The barges would then proceed to the disposal area and would dump the material within the designated footprint close to the shoreline to raise the river bottom to create an underwater shelf about 10 feet (3.0 m) below the desired final grade. The second step would be to place sand on top of the sand/silt embankment. An area of sand would be reserved as the final area to be dredged during that dredging activity. Barges would be used to dump the sand on top of the base embankment in sufficient quantity to ensure that a layer of sand at least 10 feet (3.0 m) thick covers the embankment once the final step of the process is completed (figure F-3). The footprint of the disposal area would be sized so that the maximum amount of shallow water habitat is created with the estimated quantities of material to be dredged during that dredging activity. The final step would be to use a beam drag to flatten and level the tops of the mounds to form a flat, gently sloping (3 to 5 percent) shallow area with water depths up to 20 feet (6.1 m) as measured at minimum operating reservoir level (figure F-4). The sand cap layer would be created with a minimum thickness of 10 feet (3.0 m) to ensure the most desirable substrate (sand with limited fine-grained or silt material) is provided for salmonid-rearing habitat.

There is some uncertainty regarding embankment stability because of the amount of silt to be used. The Corps recognizes that a high silt content could cause slumping or compression of the material, causing a loss in elevation of the newly created habitat. The contractor will be required to monitor and record the amount of sand and silt placed in the embankment. The Corps will then determine the percent of silt in the base and monitor any movement of the base. Monitoring would be accomplished by taking cross-section soundings after disposal is complete and again in the summer after high flows to determine if the embankment slumps or moves. The Corps would use this information to make adjustments in the percentage of silt allowable for future dredged material disposal and to determine whether or not a berm needs to be constructed around the toe of the embankment to prevent movement.

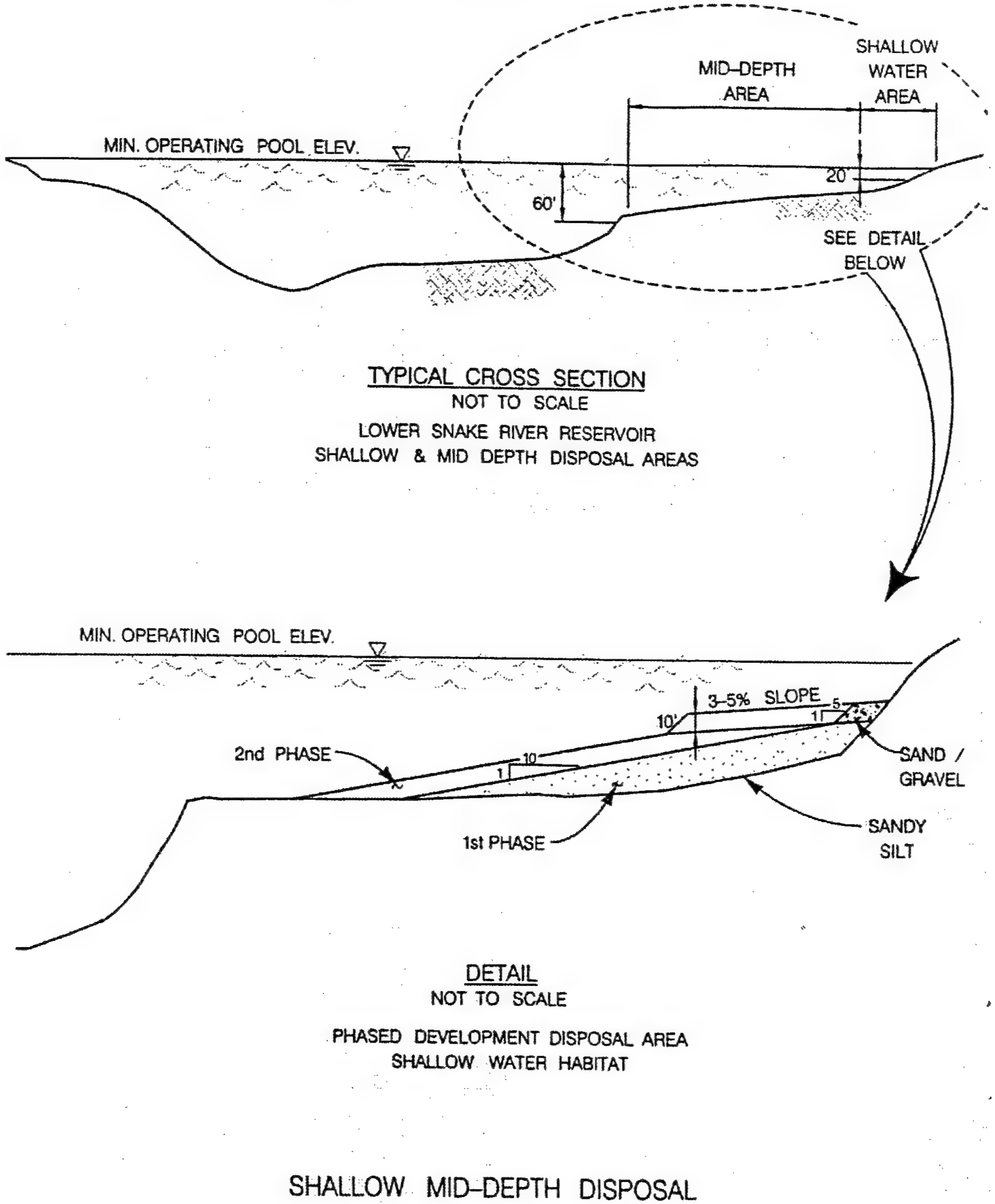


Figure F-2. Cross Section of the Phased Development Disposal Technique for Creating Shallow Water Habitat.

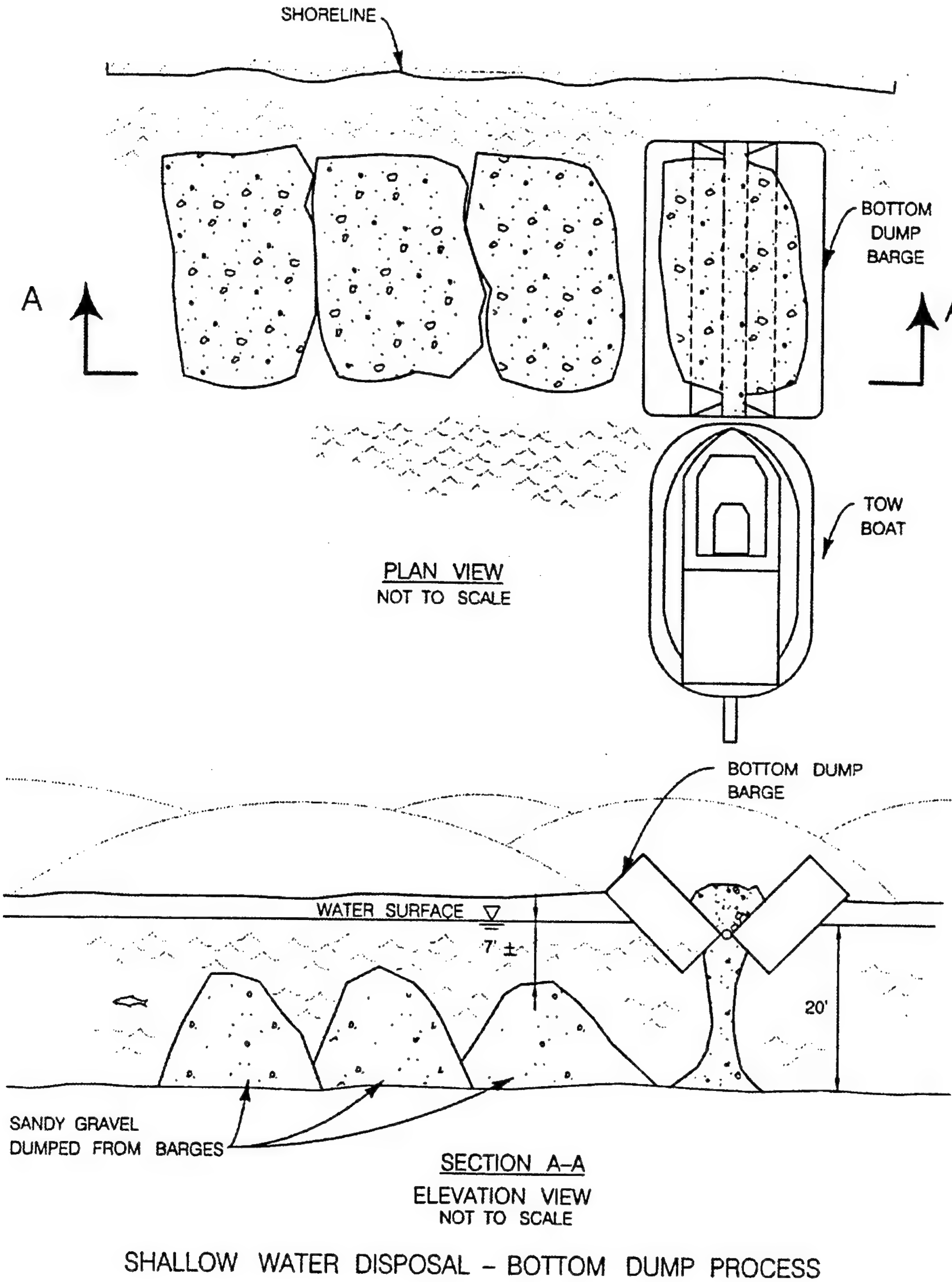


Figure F-3. Shallow Water Sediment Placement Technique Using a Bottom Dump Barge.

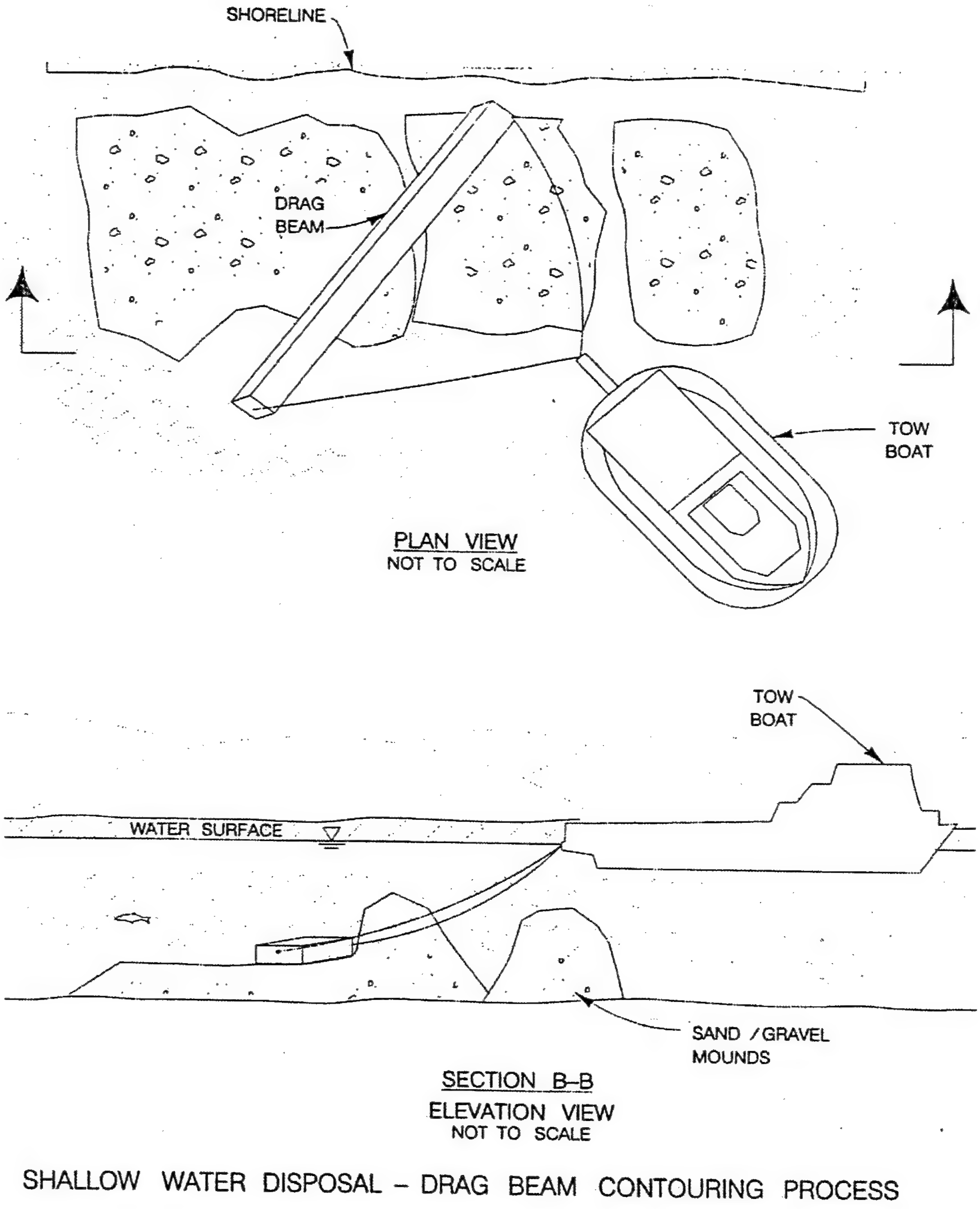


Figure F-4. Drag Beam Process for Smoothing the Placed Dredged Material for Shallow Water Salmonid Habitat.

The Corps evaluated all five reservoirs for potential sites suitable for in-water disposal. Sites were restricted to areas in the lower ends of each reservoir to eliminate the potential to negatively affect water surface levels at the upper end of each reservoir (plates 3, 8, 9, 10, and 12 through 16). The Corps concentrated its evaluation of sites on Lower Granite reservoir for several reasons. One is that this is the uppermost reservoir and juvenile salmonids found in that reservoir would benefit more from additional rearing areas and associated increased growth potential. Another reason is that there are no collection and transport facilities above Lower Granite; therefore, more juveniles use Lower Granite reservoir than the other reservoirs. Finally, most of the dredging would occur in Lower Granite reservoir; therefore, it would be more cost-effective to dispose of the material within the reservoir. However, in-water disposal to create shallow water habitat in other reservoirs will be considered depending upon the location of the dredging area, the type of material to be dredged, and the quantity to be dredged.

The Corps identified seven potential sites in Lower Granite reservoir suitable for shallow water rearing habitat creation (table F-4, plate F-1). The sites were identified because they are on the inside of a river bend, have suitable water velocities and underwater contours to facilitate habitat creation, and they are configured so the dredged material can be deposited without burying known cultural resource sites.

Table F-4. Proposed In-Water Disposal Sites Within Lower Granite Reservoir for Restoration of Shallow Water Rearing Habitat for Juvenile Snake River Fall Chinook Salmon.

Site Number	Location (RM)	Description (Landmark)	Final Disposal Depth Range	Site Acreage	Site Capacity (MCY)
1	119.5-120.5	Kelly Bar/Centennial Island - Left Bank	Shallow and Mid Completed in 1998		
2	117.5-119.0	Blyton Landing/Yakawawa Canyon - Right Bank	Shallow and Mid	87	5.3
3	115.7-117.0	Knoxway Canyon - Left Bank	Shallow and Mid	44	3.0
4	114.0-115.0	Upriver Granite Point - Right Bank	Shallow and Mid	12	1.4
5	112.5-113.5	Downriver Granite Point - Left Bank	Shallow and Mid	3	1.2
6	110.0-112.0	Wawawai - Right Bank	Shallow and Mid	51	2.1
7	108.0-109.8	Offield Landing - Left Bank	Shallow and Mid	49	2.6
Total				246	15.6

Once the Corps starts disposing at a site to create shallow water habitat, it will become a high priority to dispose of dredged material at that site for the next several dredging operations until the maximum amount of shallow water habitat has been created. It may take several dredging operations over a period of years to complete construction of the shallow water site. Exceptions to using the site would be if the material is too contaminated for in-water disposal or if the material to be dredged that year is predominantly silt and unsuitable for use in the embankment. Contaminated material would be disposed of upland either at the proposed Joso contingency upland disposal site (see Section 2.6.2) or at a licensed disposal facility depending on the level of contamination. Silt in excess of the maximum permitted during construction of the base layer for

the habitat site (not to exceed 30 percent of the total base material) would be used for another beneficial use or disposed of upland at Joso.

In 2002-2003, the Corps proposes to use dredged material for the creation of shallow-water and mid-depth fish habitat. This is described in detail in Section 2.9.3 of this report.

2.6.2 Existing Condition of Dredged Material Disposal Sites

The chronological description and status of the current habitat at the seven proposed disposal sites in Lower Granite pool are described in the following sections.

2.6.2.1 Site 1: Kelly Bar/Centennial Island - Left Bank

- In 1917 and 1934 (maps of depth soundings)...the site consisted of a sand and cobble bar shoreline with an upland alluvial terrace. A ferry crossing was located near the middle of the bar, which was approximately 9,000 feet (2,743.2 m) long with a maximum width of 1,000 feet (304.8 m). The river at this location encompassed upper Kelley's Rapid [maximum depth 4 feet (1.2 m)] near the upper one-third of the bar and an upstream reservoir [up to 24 feet (7.3 m) deep]. Spawning and rearing areas for anadromous fish were likely abundant at this location.

- In 1958 (aerial photo)...the majority of the site was covered in orchard trees from the break at the shoreline to the toe of the abutting mountain. Primitive roads crisscrossed the site including one that traversed the entire terrace just behind the riparian zone. Numerous sandbars lined the shoreline, providing likely habitat for rearing salmonids.

- In 1992 (aerial photo)...during the drawdown, the site was exposed to reveal the experimental in-water disposal area. In the mid-section of the site, dredge spoils covered a large portion of the terrace, resulting in an irregular river bed, consistent with the manner in which it was deposited.

- Current status...of this site is the Centennial Island dredge disposal area on the south shore of the river. In 1988, 1989, 1992, and 1998, the site was used for experimental in-water disposal of sediment including the deposition of fill material both above and below the existing waterline of the Lower Granite reservoir. The results of monitoring studies have indicated that the creation of this shallow water habitat has had several beneficial effects and no measurable negative effects for anadromous salmonids (Bennett et al., 1997b). However, while benefits were observed for the rearing stage, no spawning habitat for fall chinook was created.

2.6.2.2 Site 2: Blyton Landing/Yakawawa Canyon - Right Bank

- In 1917 and 1934 (maps of depth soundings)...the site was a very large bar and terrace approximately 2 miles (3.2 km) long by 1,800 feet (548.6 m) at the widest point, encompassing Kelley's Island and a high-water back channel. The geology included

cobble and sand shorelines and an alluvial mesic terrace. The main river channel contained Kelley's Island Rapids and ranged from a wide, flat cross section at the lower end [maximum depth 9 feet (2.7 m)] to a narrow, deep V in the middle [maximum depth 26 feet (7.9 m)]. Anadromous fish habitat in the area likely included spawning and rearing areas.

- In 1958 (aerial photo)...approximately 60 percent of the terrace was developed in agriculture, including orchards, wheat/hay fields, and livestock grazing, and 100 percent of the island was used for wheat/hay fields and livestock grazing. The railroad was situated between the terrace and the high-water side channel across the entire length of the terrace. Cobble and sand beaches accompanied a riffle/rapid area and likely provided rearing and spawning areas for anadromous salmonids.

- In 1974 (aerial photo)... the site was pit mined for cobble and possibly basalt. No evidence of agriculture or structures existed. Both the bar and island were scarified and denuded of vegetation in preparation for the filling of Lower Granite reservoir.

- In 1992 (aerial photo)...little of the site was exposed under the drawdown scenario.

- Current status...is a submerged area of gravel pits and rock quarries on a mid- to shallow depth bench that has been accumulating up to 2 inches (5.1 cm) of sediment per year for 25 years. Spawning and rearing habitat for anadromous salmonids is nonexistent. Human disturbances likely destroyed any culturally significant resources in the area prior to the filling of the reservoir.

2.6.2.3 Site 3: Knoxway Canyon - Left Bank

- In 1917 and 1934 (maps of depth soundings)...Knoxway Canyon came out of upland to meet the lower Snake River immediately downriver of Truax Rapid [2 to 7 feet (0.6 to 2.1 m) deep, water velocity of 7 miles per hour (mph) (11.3 km per hour) as measured in October 1917] on slightly outside bend of river. A ferry crossing across the river and a road to Pomeroy, Washington, were present up through Knoxway Canyon. The habitat quality was likely good for spawning and rearing of anadromous salmonids.

- In 1958 (aerial photo)...the proposed disposal site was positioned on an upland section of the floodplain of the greater-than-100-year flood behind a road (similar to the grass/forb-covered upland section of Wilma upriver near the Clearwater River confluence). The specific disposal site was in dryland orchard with grasses and forb coverage and was also used for livestock grazing. Riverward of the road lay a long, linear, sandy shoreline along the water's edge connected to large sandbars downriver of the canyon mouth. The habitat quality was likely good for spawning and likely very good for rearing. Road access and presence of orcharding introduced increased human disturbance, especially along the high quality sandbars.

- In 1974 (aerial photo)...vegetation and structures had been removed in preparation for reservoir fill. Habitat quality was likely poor for spawning at the foot of the rapid and likely fair for rearing.

- In 1992 (aerial photo and personal observation)...during the experimental physical drawdown test of the Lower Granite reservoir...for the previous 18 years, reservoir water covered the pre-dam shoreline and terrace up to the rock bluff face and several tens of meters up the canyon. The exposed underwater section of mid-depth bench was completely covered with silt and fine sand deposition due to low velocities; however, heavier sand was deposited on the larger opposing bar on the sharper inside bend of the river. Habitat quality was likely nonexistent for spawning at the foot of the rapid and likely lost for historic rearing. The road and presence of orcharding that introduced increased human disturbance were gone, and new rearing habitat on the previous upland parcel of orchard was likely poor quality after 18 years of slow deposition of fine material.

- Current status...is a mid- to shallow depth bench composed of silt accumulated on the left bank. Since visual inspection of this site in 1992 during the experimental drawdown of the Lower Granite reservoir, habitat suitability has been poor for rearing and overwintering due to the thick silt layer accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)] over a sand base (less than 20 percent composition). Habitat suitability for spawning is nonexistent.

2.6.2.4 Site 4: Upriver Granite Point - Right Bank

- In 1917 and 1934 (maps of depth soundings)...the site lay approximately 4,000 feet (1,219.2 m) upstream of Granite Point. The terrace is approximately 2.5 miles (4.0 km) long and 1,650 feet (502.9 m) at the widest point with a cobble/sand shoreline and upland mesic sagebrush habitat. Minimum river width is approximately 400 feet (121.9 m), encompassing Granite Point Rapids. Spawning habitat for anadromous salmonids was likely abundant due to proper substrate and velocities in the area. High quality rearing areas were on the south shore across from the proposed disposal site.

- In 1958 (aerial photo)...the proposed site was developed for agriculture including orchards, grazing, and hay/wheat fields. A railroad bisected the terrace approximately midway between the shore and toe of the mountain. Roads and outbuildings existed on the upstream and downstream ends of the terrace.

- In 1974 (aerial photo)... no evidence of farming was left on the terrace. The railroad was relocated to the mountainside and the entire site was a construction site and gravel pit. Outbuildings and macro-vegetation were removed pending the completion of Lower Granite Dam and filling of the reservoir.

- In 1992 (aerial photo)...little of the site was exposed during the experimental drawdown test.

- Current status...is a mid- to shallow depth bench on the north shore composed of silt covering a former gravel pit and construction site. Habitat suitability has been poor for rearing due to the thick silt layer accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)] and habitat suitability for spawning is nonexistent.

2.6.2.5 Site 5: Downriver Granite Point - Left Bank

- In 1917 and 1934 (maps of depth soundings)...the site had a cobble and sand shoreline with an upland mesic terrace composed of alluvium approximately 1 mile (1.6 km) long and maximum width of 500 feet (152.4 m). River channel cross section was variable; however, the river did not exceed 20 feet (6.1 m) in depth. Rearing habitat along the shorelines and some spawning habitat likely existed.

- In 1958 (aerial photo)...the site had sand and cobble beaches with a well-developed riparian zone. The terrace was in agriculture including orchards, row crops, and hay/wheat fields. A primitive road paralleled the shoreline for the length of the site just upland from the riparian zone.

- In 1974 (aerial photo)...the farmland had been cleared and the riparian zone appeared to be regenerating (since it was heavier than in earlier photos) indicating that the site had been abandoned for some time. Buildings and orchards had been removed in preparation of the completion of Lower Granite Dam and filling of the reservoir.

- In 1992 (aerial photo)...little of the site was exposed during the experimental drawdown tests.

- Current status...this site on the south shore is a mid- to shallow depth bench composed of silt accumulated on the left bank. Habitat suitability has been poor for rearing due to a thick silt layer accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)]. Habitat suitability for spawning is nonexistent.

2.6.2.6 Site 6: Wawawai - Right Bank

- In 1917 and 1934 (maps of depth soundings)...the site was a terrace approximately 2.5 miles (4.0 km) long and a maximum width of 1,400 feet (426.7 m) on the inside of a large bend. A ferry terminal was located at the mouth of Wawawai Canyon. Beaches were composed of sand and cobble and the upland terrace was composed of alluvium. Maximum river depths in this section were 27 feet (8.2 m) with no rapids indicated in the survey. Spawning habitat may have been present and rearing habitat was likely abundant, primarily on the south shore.

- In 1958 (aerial photo)...the site was completely developed in agricultural land, primarily orchards and row crops. The riparian zone was disconnected from the terrace by a steep slope and a railroad that paralleled the entire shoreline.

- In 1974 (aerial photo)...all of the agricultural land was cleared, farm buildings were removed, and multiple roads built that crossed the entire terrace in preparation of completion of Lower Granite Dam. Rock quarries, gravel pits, and large storage lots covered the site. The railroad was relocated from the shoreline to the higher elevation along the hillside.

- In 1992 (aerial photo)...little of the site was exposed during the experimental drawdown tests.

- Current status...this site is a mid- to shallow depth bench on the north shore of the river composed of silt accumulated on the right bank covering a former construction site. Habitat suitability has been poor for rearing due to the thick silt layer accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)] and habitat suitability for spawning is nonexistent.

2.6.2.7 Site 7: Offield Landing - Left Bank

- In 1917 (map of depth soundings)...the site was a sand and cobble bar with an upland mesic terrace of alluvium, approximately 2 miles (3.2 km) long with a maximum width of 1,200 feet (365.8 m). The channel cross section at the midpoint encompassed Offields Rapids [maximum depth 5.5 feet (1.7 m)] and a wide V-shaped channel [28 feet (8.5 m) maximum depth]. Spawning and rearing habitat were likely abundant.

- In 1958 (aerial photo)...agricultural development, composed of row crops, orchards, and wheat fields, encompassed the entire terrace. An apparent wing dam that was present in the 1917 survey near Offields Rapids appears to have been maintained and possibly extended.

- In 1974 (aerial photo)...all farming activity had ceased and the designated area was a construction site for the building of Lower Granite Dam. The entire bar, up to the dam site itself, was a rock quarry and little of the original shoreline or upland terrace existed.

- In 1992 (aerial photo)...little of the site was exposed during the experimental drawdown tests.

- Current status...this site is a mid-depth bench on the south shore upstream from the current location of Lower Granite Dam, composed of silt over a large submerged construction site. Habitat suitability has been poor for rearing due to thick silt layer accumulating at about 2 inches (5.1 cm) per year for 25 years [approximately 4 feet (1.2 m)] and habitat suitability for spawning is nonexistent.

2.6.3 Upland Disposal

A contingency upland disposal site has been identified at the Joso HMU (plates 11 and F-2). This site will serve for disposal of the small portion of dredged material that may contain low

levels of contaminants and is, therefore, unsuitable for in-water disposal. It would be isolated at the Joso upland disposal site (RM 56.5) where appropriate confinement measures would be taken (e.g., an impervious liner to prevent leaching of unsuitable or contaminated materials).

Uncontaminated material may be unsuitable for in-water disposal as well (e.g., too much silt for use in creating shallow-water fish habitat). This material would be disposed of in a separate area of the Joso site. All material would be disposed of within the confines of the existing gravel pit and no material would be disposed of on the surrounding shrub-steppe vegetation.

Use of the Joso site would require reconstruction of some facilities and construction of others (plate F-2). Construction activities are anticipated to take place in the fall of 2002. The existing barge slip would likely need to be dredged to restore access. Up to 79,000 CY (60,399.8 m^3) of cobbles and silt may need to be dredged to re-establish a channel 14 feet (4.3 m) deep and up to 212 feet (64.6 m) wide. The barge slip would also be reconstructed using sheet pile to provide vertical walls and tie-off facilities. This reconstruction would require removal of a 15-foot-wide by 150-foot-long (4.6-meter-wide by 45.7-meter-long) riparian vegetation strip composed of primarily false indigo and water hemlock at the east end of the slip (figure F-5). Temporary dredged material dewatering and storage areas with containment berms and detention ponds would be constructed adjacent to the slip. The material would be off-loaded from the barges and placed in the temporary storage for dewatering. Water from the dewatering basins would likely return to the river; however, due to the nature of the operation, little turbidity increase would be expected. Material would then be loaded onto trucks for transport to the disposal area. Once there, the material would then be placed in lifts using track-type tractors and compacted, resulting in a large structural fill conforming to the established final topography for the disposal area. Areas that reach final grades would be restored on a periodic basis by placing 6 inches of topsoil and re-seeding with native grasses to achieve a vegetative cover similar to undisturbed native sites. Filling the gravel pit with sediment and seeding it to grass would improve the site's value as wildlife habitat.

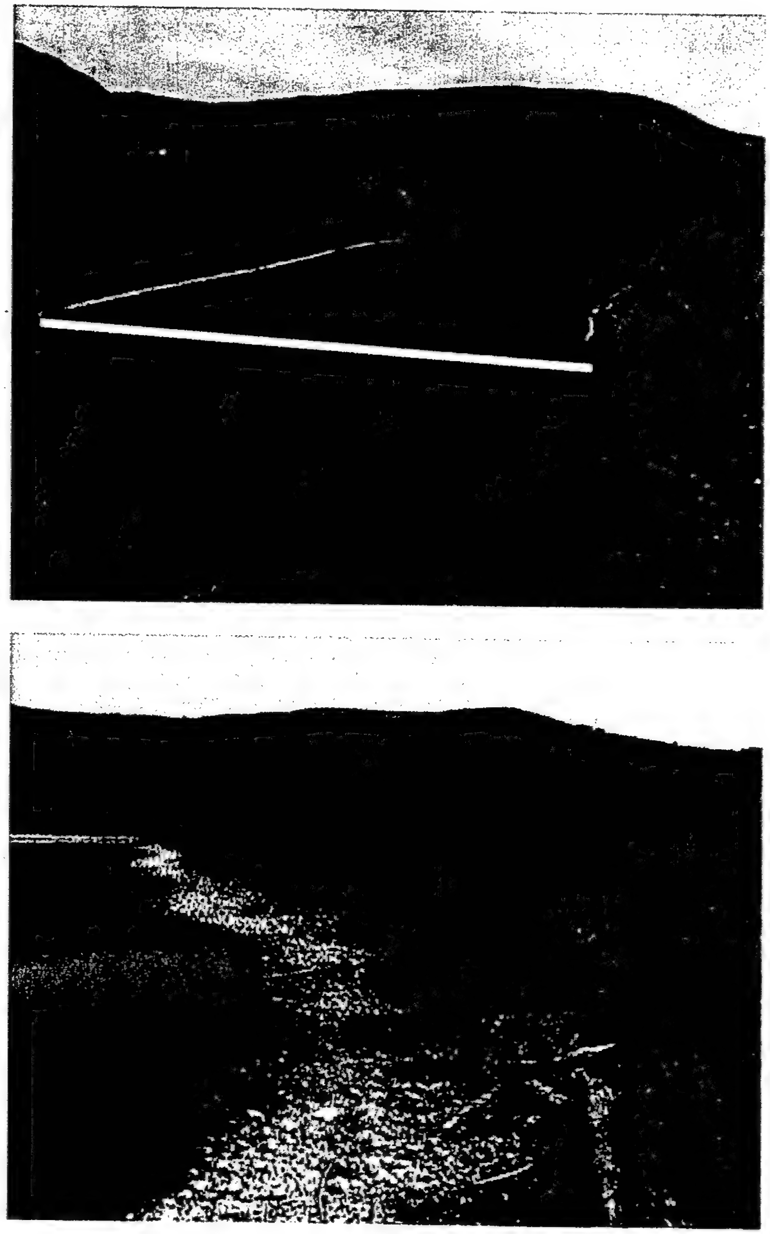


Figure F-5. Expected Riparian Vegetation to be Removed (Top, Looking West) at the Joso Barge Slip Area With a Close-Up of the Vegetation (Bottom, Looking North).

2.7 Levee Raise

The cities of Lewiston and Clarkston are adjacent to the Lower Granite reservoir. Lewiston is protected by a backwater levee system installed in lieu of relocating its business district. The levee system is an upstream extension of the dam and is designed to allow the Lower Granite reservoir to be operated to protect the Lewiston/Clarkston area from inundation during an SPF.

The upper reach of the Lower Granite reservoir collects much of the sediment carried in suspension in the free-flowing reaches of the upstream rivers. Sediment accumulation in the reservoir over time has reduced the flow conveyance capacity in this upper reach and has compromised the level of protection provided by the levees. This project would raise the west Lewiston levee (plate 17) by as much as 3 feet (0.9 m) in order to maintain flow conveyance and provide flood protection.

The 3-foot (0.9-m) levee raise involves adding an earth embankment raise to existing levees. The plan would include raising a portion of the west Lewiston levee and modifying Highway 129 and the Snake River Road upstream of Asotin, probably by raising the road. The levee raise would also increase the risk of flooding of the convenience store at Hells Gate State Park, the U.S. Forest Service building at Swallows Park, and the Corps' buildings at Clarkston.

In order to raise the levee, recreation paths would be removed and height would be added using embankment of impervious gravel. The top of the existing levee would first be excavated to the impervious core and filter to allow the new impervious gravel backfill to tie to the existing core and filter. A 12-foot (3.7-m) top width would be provided for access and maintenance and recreational paths would be reestablished.

2.8 Emergency Dredging

The Corps may need to perform dredging on an emergency basis. An emergency, as defined in 33 CFR 335.7, is a situation that would result in an unacceptable hazard to life or navigation, a significant loss of property, or an immediate and unforeseen significant economic hardship if corrective action is not taken within a time period less than the normal time needed under standard procedures.

There are several potential situations that could occur in the Snake and Columbia Rivers that may require emergency dredging. High flows could deposit enough sediment at a point or points in the Federal navigation channel to block navigation. Rock could be swept into the navigation lock approach and form a shoal or sediment could build up on the inside bend of the navigation channel, posing an unacceptable navigation hazard.

For an emergency dredging situation, the Corps would perform environmental coordination on an expedited basis. The Corps would perform as much coordination as possible before initiating the emergency dredging, but some coordination may be performed during the dredging or after the dredging is completed.

Under an emergency dredging situation, only the immediate area would be dredged; therefore, the quantities of material to be removed would likely be small. If the emergency dredging occurs in the summer, the material would be disposed of upland, either at a site where it provides beneficial use or at the Joso site. If the emergency dredging occurs in winter, the material could be disposed of either in-water or upland. Should the material be sand, it may be disposed of in-water at an existing in-water disposal site to aid in creation of shallow water habitat. If the material is silt, it would be used for beneficial purposes upland or disposed of upland at the Joso site.

2.9 Dredging and Dredged Material Management: 2002-2003

This section describes the specific proposal for maintenance dredging and dredged material disposal to be performed in the winter of 2002-2003 (the first dredging opportunity following completion of the DMMP/EIS).

2.9.1 Description of Dredging Areas

This section describes the specific proposal for maintenance dredging and dredged material disposal to be performed in the winter of 2002-2003 (the first dredging opportunity following completion of the DMMP/EIS).

Much of the 2002-2003 dredging will take place at the confluence of the Snake and Clearwater Rivers in the Clarkston, Washington/Lewiston, Idaho, area. The Corps plans to remove about 183,000 CY (139,913.5 m^3) of sediment from the Federal navigation channel near the confluence and another 7,300 CY (5,581.3 m^3) from the port berthing areas (Port of Clarkston and Port of Lewiston). Other sites to be dredged in the confluence area include Hells Canyon Resort Marina entrance, the Greenbelt Boat Basin, and the Swallows Park swimming beach and boat launch (table F-5 and plate 17).

The Corps also plans to dredge up to eight sites outside of the confluence area in 2002-2003. These include the downstream approaches to both Lower Granite and Lower Monumental navigation locks (plates 15 and 10). Two boat launches, Illia at RM 104 (plate 15) and Willow at RM 88 (plate 14) on the Snake would be dredged. Up to 79,000 CY (60,399.8 m^3) of material would be dredged from the barge slip at the Joso contingency upland disposal site at Snake RM 56 (plate 11). There is also one irrigation intake at Hollebeke HMU (RM 25) that requires sediment removal (plate 9). Two areas tentatively identified for dredging in 2002-2003 are the Port of Walla Walla barge slip access channel at the Boise Cascade Plant and the Federal navigation channel in the Schultz Bar area (plates 4 and 15). Each would require a fairly significant amount of dredged material removal [121,000 CY (92,511.1 m^3) and 75,000 CY (57,341.6 m^3), respectively].

Table F-5. Sites Proposed for Dredging in 2002-2003 and the Estimated Quantities for Each.

Site Number	Site to be Dredged	Quantity to be Dredged (CY)
1	Federal Navigation Channel at Confluence of Snake and Clearwater Rivers	183,120
2a	Port of Clarkston	5,559
2b	Port of Lewiston	1,700
3a	Hells Canyon Resort Marina	3,532
3b	Greenbelt Boat Basin	2,747
3c	Swallows Swim Beach/Boat Basin	24,852
3d	Lower Granite Dam Navigation Lock Approach	3,139
3e	Lower Monumental Dam Navigation Lock Approach	19,987
4a	Illia Boat Launch	1,439
4b	Willow Landing Boat Launch	3,924
4c	Hollebeke HMU Irrigation Intake	3,270
5	Joso Barge Slip	79,000
6	Little Goose Pool – Schultz Bar	75,000
7	Boise Cascade Barge Channel	121,000
	TOTAL	**528,269**

2.9.2 Description of Material to be Dredged

The type of material to be dredged depends on the location of the dredging. In the Snake/Clearwater Rivers confluence area, the Corps expects to find a mix of coarse sand, fine sand, silt, fine silt, and organic material (wood particles). This determination is based on samples taken during previous dredging operations and in June 2000. The Corps expects to find sand in the main navigation channel and silt/fines near the shore, in the port areas, and in the Greenbelt Boat Basin. The Corps also expects to find silt in the other boat basins, the irrigation intakes, and the Port of Walla Walla channel at Boise Cascade.

In the area below the Lower Granite and the Lower Monumental navigation locks, the Corps expects to find river cobbles 2 to 6 inches (5.1 to 15.2 cm) in diameter with little fines and possibly some large rock up to 18 inches (45.7 cm) in diameter. Based on previous surveys, it is anticipated that redds could possibly be found in the dredging areas immediately downstream of the dams. Prior to dredging, the Corps would conduct salmon redd surveys in these areas to ensure no redds would be disturbed by dredging or disposal.

2.9.3 Disposal Methods and Locations

The Corps plans to use the dredged material for beneficial use. At this time, the Corps proposes to use in-water disposal for the majority of the dredged material to create shallow water and mid-depth fish habitat. The Corps has identified potential in-water disposal locations for the dredging to be performed in 2002-2003. However, the Corps is requesting input from the LSMG for

additional proposals for beneficial use of the dredged material. The selected beneficial use of the material to be dredged in 2002-2003 will be determined prior to the signing of the ROD for the DMMP/EIS.

For the 2002-2003 dredging, the Corps would dispose of dredged material in a way similar to that described in the DMMP/EIS as Alternative 2 - Maintenance Dredging with Beneficial In-Water Disposal. The Corps has collected sediment samples from most of the areas to be dredged and has identified which sites or portions of sites contain mostly silt and which ones contain mostly sand or coarser material. For all of the dredging, except the Lower Monumental navigation lock approach, the disposal location would be at RM 116 in Lower Granite reservoir (plates 15, 16, F-1). This site is a shallow bench on the left bank of the Snake River just upstream of Knoxway Canyon. The Corps selected this site because it is close to the confluence (where most of the dredging would occur), could provide suitable resting/rearing habitat for juvenile salmon once the river bottom is raised, would not interfere with navigation, would not impact submerged cultural resources, and is of sufficient size to accommodate dredged material disposal for several years.

The dredged material disposal at RM 116 is designed to accomplish two goals: (a) create shallow water habitat for juvenile salmon and (b) dispose of silt in a beneficial manner. Studies conducted on the lower Snake River from 1988 to 1993 indicated that substrate of sand, gravel, and/or cobble provided suitable habitat for juvenile salmon while silt substrate provided no benefit (Bennett et al., 1997).

To meet its goals, the Corps proposes to place the dredged material in steps. The first step would be to use the silt [less than 0.008 inch (0.2 mm) in diameter] in a mixture with sand and gravel/cobble to fill the mid-depth portion of the site and form a base embankment. The dredged material would be placed aboard bottom dump barges and analyzed to determine the percentage of sand or silt. The barges would then proceed to the disposal area and would dump the material within the designated footprint close to the shoreline to raise the river bottom to a depth of 20 feet (6.1 m).

The second step would be to place sand on top of the sand/silt embankment. The contractor would be directed to reserve an area of sand as the final dredging site. The contractor would use barges to dump the sand on top of the base embankment so a layer of sand at least 10 feet (3.0 m) thick covers the embankment and the water depth is about 10 feet (3.0 m) deep as measured at minimum operating reservoir. The footprint of the disposal area would be sized so that the maximum amount of shallow water sandy substrate habitat is created with the estimated quantities of material to be dredged. The third step would be to use a beam drag to flatten and level the tops of the mounds to form a flat, gently sloping (3 to 5 percent) shallow area between 10 and 12 feet (3.0 and 3.7 m) in depth.

The material removed from the Lower Monumental navigation lock approach would be disposed of in one of several ways. The most cost-effective way would be to dispose of the material in-water at Lost Island HMU, which is located in the Ice Harbor reservoir on the right bank of the Snake River at RM 22-23 (plates 9 and 31). The site is on the downstream end of a river bar and was used as the disposal site for the 1998-1999 dredging of the same navigation lock

approach. A small mound of cobbles from the previous disposal is located near the shoreline. The contractor would nudge the barge as close to the river bank as possible at the upstream edge of the disposal area before dumping the material on top of the existing mound. The contractor would continue to dispose of dredged material on top of the mound until the water was 15 to 20 feet (4.6 to 6.1 m) deep. The material would then be dumped on the downstream slope of the mound to create an embankment parallel to the shoreline.

There are two other possible disposal options identified for the Lower Monumental navigation lock material. One is to barge the material to RM 116 and add it to the embankment material. The other is to stockpile the cobble in an upland location. The stockpile could then be used for other projects such as creation of riparian planting areas or shoreline stabilization combined with riparian plantings.

2.9.4 Sediment Contaminant Analysis

In June 2000, the Corps sampled most of the proposed 2002-2003 dredge sites for sediment type and contaminant level. Chemical sampling was conducted on sediments for polynuclear aromatic hydrocarbons (PAH's), organophosphates, chlorinated herbicides, oil, grease, glyphosate, ampa, dioxin, and heavy metals. None of the contaminants were found in concentrations exceeding regulatory thresholds.

Results from herbicide and pesticide tests were below reportable laboratory detection testing levels. The PAH's and metal concentrations were below standards for the compounds listed in the Washington Department of Ecology Draft Sediment Standards dated June 1999. For the glyphosphate tests, only one site located in the Green Belt Boat Basin at Clarkston showed glyphosphate above lab detection limits at 23 parts per billion. Two other samples for glyphosphate in the same boat basin came back below reportable lab detection limits. This compound is highly soluble and should biodegrade.

Twenty-four sites were sampled and tested using method EPA 4425 for dioxin in the Lower Granite reservoir at and below the confluence of the Snake and Clearwater Rivers. Chlorinated furans and dioxin congeners have been detected in the past in this area (1991, 1996, and 1998). The June 2000 results showed seven sites containing some chlorine dioxin congeners. One is at the confluence and four sites are on or near the left bank traveling downstream (RM 139.1 and RM 138.4). The seven sites that tested positive on the dioxin screen were tested further with high-resolution gas chromatograph-mass spectrometric methods. Two additional duplicate samples were included. Results showed that there were no concentrations of 2,3,7,8 TCDD, considered a very potent carcinogen according to Universal Treatment Standards. Less toxic congeners were present in small amounts (parts per trillion)

These congeners were found at all seven sites: Octachlorodibenzodioxin (OCDD) ranging from 8.81 to 166.94 parts per trillion; 1,2,3,4,6,7, 8-Heptachlorodibenzodioxin (HpCDD) from 1.05 to 22.15 parts per trillion; 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) at 0.29 to 2.99 parts per trillion; and octachlorodibenzofuran (OCDF) at 0.57 to 19.61 parts per trillion. 1,2,3,4,7,8-haxachlorodibenzofuran (HxCDF) found at four sites ranged from 0.12 to 1.15 parts per trillion.

1,2,3,6,7,8-Hexachlorodibenzodioxin (HxCDD) found at two sites ranged from 0.42 to 1.21 parts per trillion.

Ammonia is quickly becoming a primary contaminant of concern because of its relatively high concentrations recently found in most of the lower Snake River fine sediments (silt). Over the last 5 years, most of the potential dredging sites in the lower Snake River have been tested for the concentration of ammonia in sediment. Ammonium (NH_4+) itself is generally only toxic in large concentrations. It is the un-ionized portion of ammonia (NH_3) that is toxic to aquatic organisms. Un-ionized ammonia is more toxic because it is a neutral molecule and, thus, has the ability to diffuse across the epithelial membranes of aquatic organisms far more readily than a charged ion. High external un-ionized ammonia concentrations reduce or reverse diffusive gradient and cause the buildup of ammonia in gill tissue. Assuming that ammonia and un-ionized ammonia have different partial toxicity, the un-ionized ammonia is 100 times more toxic than ionized ammonia. Studies show that un-ionized ammonia toxicity has a measurable correlation to pH.

Ammonia is present in sediments in each of the four reservoirs of the lower Snake River. The concentration of ammonia in the sediments, when compared to the potential amount of dissolved ammonia, makes unconfined excavation of sediments in the summer undesirable because the amount of un-ionized ammonia increases as water temperature increases. Un-ionized ammonia also increases dramatically when levels exceed 7.5 pH.

Waters of the Snake River have a high alkalinity with a pH typically between 7.8 and 8.5. Elutriation tests were conducted in 1997 to obtain estimates of ammonia dissolved in the water after in-water suspension of dredged material. Table F-6 compares elutriation data to average concentrations of sediment ammonia for each reservoir, to average reservoir pH, and to the National Criterion for Ammonia in Fresh Water (EPA, 1999). This risk assessment, based on chronic and acute criterion for fish (EPA, 1999), was then conducted.

Potential impacts varied for each reservoir. Potential impacts from ammonia in the Lower Granite reservoir were judged to be extremely high because the elutriate ammonia average (3.6 mg/L at 8.5 pH) could exceed the early life stage criterion three-fold and could exceed both acute criterions (2.14 mg/L and 3.20 mg/L). Potential impacts from ammonia in the Little Goose, Lower Monumental, and Ice Harbor reservoirs were judged to be moderate because the elutriate ammonia average could exceed the chronic early life stage criterion.

Table F-6. Risk Assessment of Potential Impacts of Increased Ammonia Levels Upon Fish.

	Lower Granite	Little Goose	Lower Monumental	Ice Harbor
Elutriate Ammonia Average in mg/L	3.6 mg/L	2.6 mg/L	2.5 mg/L	3.6 mg/L
Dissolved Elutriate Percentage	4.7%	4.0%	4.2%	4.4%
Average Forebay Concentration of Ammonia in mg/kg	75.7 mg/kg	64.3 mg/kg	59.6 mg/kg	81.3 mg/kg
Average pH in Winter (data source)	8.5 pH (1)	8.3 pH (2)	8.1 pH (3)	8.0 pH (2)
Early Life Stage Chronic Criterion	1.09 mg/L	1.52 mg/L	2.10 mg/L	2.43 mg/L
Acute Criterion with Salmon Present	2.14 mg/L	3.15 mg/L	4.64 mg/L	5.62 mg/L
Acute Criterion with Salmon Absent	3.20 mg/L	4.71 mg/L	6.95 mg/L	8.40 mg/L
Predicted Risk of Impact	Extremely High	Moderate	Moderate	Moderate

(1) Prototype BGS Installation at Lower Granite.
(2) Estimated pH from previous unpublished data.
(3) 1998 LSRF Data.

The potential impacts from ammonia in the McNary reservoir are unknown. The Corps has no data for the sites that might be dredged. However, the Corps would expect elevated concentrations of ammonia in the sediments in McNary reservoir. This is based on the deposition pattern of sediment from the Snake, Yakima, and Walla Walla Rivers entering the Columbia River and the knowledge that much of the sediment from these rivers is silt.

Thirty-eight locations were sampled for oil and grease. Results varied from 41 to 770 parts per million (ppm). Only three of the samples exceeded 400 ppm and they were downstream from boat basins. Total organic carbon (TOC) testing was run on the oil and grease samples and the glyphosate sample that was above detection limits. The TOC's for oil and grease averaged 1.2 percent and ranged from 0 to 5.8 percent. The TOC for the glyphosate sample was 1.6 percent. These sites all yielded concentrations of PAH chemicals below reportable lab detection limits, oil and grease composition was probably from animal matter.

The Corps will sample the remaining dredging sites for sediment type and contaminant levels prior to the 2002-2003 dredging. Based on previous dredging activities, the Schultz Bar area is expected to be predominantly sand with low potential for contamination. The Joso barge slip material is expected to be cobbles with some fines. The possibility of contaminants in the cobble material is low. Based on previous dredging activities, the Port of Walla Walla site at Boise Cascade is expected to be silt with a potential for contamination. However, the levels of contaminants in the silt are not expected to exceed regulatory thresholds.

3.0 PROJECT IMPACTS ON ESA-LISTED ANADROMOUS SPECIES

The following anadromous species are listed as either endangered or threatened under the ESA.

- Endangered:

  Snake River Sockeye Salmon (*Oncorhynchus nerka*)
  Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*)
  Upper Columbia River Steelhead (*Oncorhynchus mykiss*)

- Threatened:

  Snake River Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha*)
  Snake River Spring/Summer-Run Chinook Salmon (*Oncorhynchus tshawytscha*)
  Snake River Basin Steelhead (*Oncorhynchus mykiss*)
  Middle Columbia River Steelhead (*Oncorhynchus mykiss*)

3.0.1 Critical Habitat Considerations

The project areas are designated to be Critical Habitat for all three Snake River salmon Evolutionarily Significant Unit (ESU) stocks, Snake River Basin Steelhead, Upper and Middle Columbia River Basin Steelhead, and Upper Columbia River Spring Chinook Salmon. In designating Critical Habitat, NMFS considers the following requirements of the species: (a) space for individual and population growth, and for normal behavior; (b) food, water, air, light, minerals, or other nutritional or physiological requirements; (c) cover or shelter; (d) sites for breeding, reproduction, or rearing of offspring; and, generally, (e) habitats that are protected from disturbance or are representative of historical geographical and ecological distributions of the species.

In addition to these factors, NMFS also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection, termed Essential Fish Habitat (EFH) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation [50 CFR 424.12(b)], and can generally be described to include the following: juvenile rearing areas; juvenile migration corridors; areas for growth and development to adulthood; adult migration corridors; and spawning areas. Within these areas, essential features of Critical Habitat include adequate: substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. Adjacent riparian area is defined by NMFS as the area adjacent to a stream (river) that provides the following functions [components of Properly Functioning Habitat (PFH) or Properly Functioning Condition (PFC)]: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

Section 9 of the ESA makes it illegal to "take" a threatened or endangered species of fish. The definition of "take" is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" [16 U.S.C. 1532(19)]. The NMFS interprets the term "harm" in the context of habitat destruction through modification or degradation as an act that actually kills or injures fish.

Visual surveys of 1934 sounding data used to recreate the pre-dam lower Snake River channel (Lower Snake River Juvenile Salmon Migration Feasibility Study, Fluvial Geomorphology Appendix H and Snake River Maps Appendix S, USACE 1999) demonstrate that an unimpounded large class river is primarily composed of greater than 70 percent shallow water habitat. This habitat is in the form of opposing deposition bars of sand for most flow years and at least 50 to 60 percent shallow water habitat for very high flow years. It is possible that 10 percent of the lower Snake River could have constituted deep water.

The filling of Lower Granite reservoir in 1975 inundated the historical shallow water habitat. This converted approximately 40 to 60 percent of the shallow water sand bar habitat used by juvenile fall chinook salmon into either mid-depth bench habitat, more suitable for white sturgeon (with minimal structural cover) or adults of resident predator species (with structure in the substrate) or deep water habitat used by few species (table F-7). An analysis of limiting conditions for reservoir-wide habitat readily indicates that low gradient, open sand, shallow water habitat (with no additional cover structure) suitable for fall chinook salmon rearing habitat, should be the objective target for maximizing beneficial use of in-water disposal of dredged material.

Table F-7. Absolute and Relative Quantification of Three Water Depth Habitats in Lower Granite Reservoir, Snake River (SR) and Clearwater River (CR) During the Early to Mid-1980's.

Pool Reach (RM)	Shallow (<20 ft) Acres (Percent)	Mid-Depth (20-60 ft) Acres (Percent)	Deep (>60 ft) Acres (Percent)	Total Acres (Percent of Total Pool or Reach)
SR107.4 – SR120.46	281 (8%)	1,241 (34%)	2,147 (57%)	3,669 (43%)
SR120.46 - SR146.33	983 (8%)	2,795 (58%)	1,017 (21%)	4,795 (57%)
SR107.4 – SR146.33	1,264 (15%)	4,036 (48%)	3,164 (37%)	8,464 (94%)
CR0.0 - CR4.4	349 (71%)	141 (29%)	0 (0%)	489 (6%)
SR107.4 - SR146.33 and CR0.0 - CR4.4	1,612 (18%)	4,177 (47%)	3,164 (35%)	8,953 (100%)

Notes:
(1) Estimates calculated from U.S. Army Corps of Engineers cross section profiles.
(2) SR120.46 is the mid-reservoir section where the majority of the fine silt and sand material settles out due to increased rate of depth affecting the slowing rate of water velocity.

Apart from this comparison between the abundance and suitability of historical versus existing shallow water sandbar habitat, very few of the EFH components that existed along the shoreline of the lower Snake River reservoirs have been modified or eliminated in the recent past due to maintenance dredging. On the other hand, other associated human activities and economic growth along the shorelines have resulted in some modification of habitat that introduced additional needs for dredging. The two EFH components that may have been influenced by confluence dredging in the past are juvenile migration corridor and adult migration corridor. Specifically, the essential features of substrate, water quality, food (as in macroinvertebrate production), and safe passage conditions were affected. Adjacent to the footprint boundary for dredging in the confluence is a critically important juvenile rearing area for fall chinook salmon in the embayment of Wilma (Snake RM 134). The existing open, sandy, shallow-water rearing habitat within Wilma remains protected from modification of any bathymetric feature and will not be affected by the proposed dredging in the main stem channel. Dredging activities will be confined to the in-water work window and in off-channel areas when water temperatures exceed 70 °F (21.1 °C) when no or very few salmonids would be either migrating or requiring pre-migration rearing, so exposure to short-term increases in turbidity should not exist. Dredging is not allowed at elevations below the existing channel bottom contours because removal of input sand and silt is the target; hence, native substrate classes of cobble and gravel suitable for spawning should not be affected. It has been routinely shown that macroinvertebrates displaced by dredged material removal aid in colonizing or supplementing existing populations at the in-water disposal sites. Populations at the removal site also become re-colonized relatively rapid depending upon season. Both locations are also influenced through the mechanism of drift. (Bennett et al., 1990, 1991, 1993a, 1993b, 1995a, 1995b; Bennett and Nightingale, 1996)

The EFH components that may be influenced by dredging in the boat basins and/or their approaches from the main channel are juvenile rearing areas, juvenile migration corridors, and adult migration corridors. Specifically affected essential features would be substrate, water quality, water velocity, food (as in macroinvertebrate production), and safe passage conditions. Boat basins and HMU water intake basins fill with fine substrate dominated by silt that is not suitable substrate preferred by salmonids. In addition, high use by recreational boat traffic can limit the basin's suitability for salmonid rearing. Dredging activities will be confined to the in-water work window and in off-channel areas when water temperatures exceed 70 °F (21.1 °C) when no or very few salmonids would be migrating or rearing, so exposure to short-term increases in turbidity should not exist. Removal of unsuitable size classes of substrate should not have a negative effect. These areas will be dredged by mechanical means to virtually eliminate the possibility of entrainment of any juvenile salmonid that may be present. However, if hydraulic means is chosen, it would be limited to HMU irrigation intakes and would use fish exclusion techniques. Water velocities will not be affected since these areas are functionally shallow water back eddies more suitable for resident fish. Macroinvertebrates displaced by dredged material removal can aid in colonizing or supplementing existing populations at the in-water disposal sites and populations at the removal site become recolonized relatively rapid depending upon season. Substrate quality in boat basins that have not been dredged in a number of years, such as the Hells Canyon Resort Marina, add an additional concern with the potential for the accumulation of bound contaminants in the silt as a result of both spillage from recreational watercraft fueling and activities and those brought downriver that settle in the backwater eddy environment. Recent sampling in these basins indicates that concentrations of

contaminant indicators are below the level that would preclude their disposal in water. In the event that a pocket of visually contaminated sediments is hauled up in the clamshell or bucket, the Corps would direct that such an area be classified and investigated as Hazardous Waste and deposited in a truck for removal to an appropriate established waste disposal site.

Some of the EFH components may be potentially influenced by dredging in the lock approaches of lower Snake River dams. Specifically, the essential features of substrate, water velocity, cover/shelter, and possibly food (as in macroinvertebrate production) may be affected. Prior to dredging, these areas will be surveyed for redds according to established protocol (Dauble et al., 1995) to determine if modifications to velocity and substrate could cause salmon to avoid these areas for spawning. If redds are found and verified, the location and duration of dredging will be modified to avoid the area.

The Corps believes that periodic maintenance dredging performed on a schedule of every 2 to 3 years and contained entirely within the previously disturbed footprint would not degrade the suitability of that habitat for Snake River Spring/Summer-Run and/or Fall-Run Chinook Salmon, and/or Snake or Middle Columbia River Basin Steelhead, thus not adversely modifying Critical Habitat or EFH components of that Critical Habitat. This determination is made because the area is used primarily as a migration corridor for all life stages of these stocks. Migration of each life stage of each stock has terminated for the brood years with two exceptions: (a) The potential for utilization of the submerged shallow water for rearing and feeding by chinook and steelhead and (b) some adult migration by B-run steelhead to upriver tributaries to hold for spawning in the following spring. None of the known or potential areas used by fall chinook for rearing will be disturbed by any dredged material removal action.

3.0.2 Effects of Actions Common to ESA-Listed Anadromous Species

Nearly all dredging will be completed mechanically using a clamshell. Due to the characteristics of this equipment, it is generally accepted that clamshell buckets do not have the potential to entrain fish. Specifically, the clamshell bucket descends to the substrate in an open position. The force generated by the descent drives the jaws of the bucket into the substrate, which "bite" the sediment upon retrieval. During the descent, the bucket cannot trap or contain a mobile organism because it is totally open. Based on the operation of the clamshell dredge bucket, it is determined that the dredging operation would not entrain any salmonid species. The limited use of hydraulic dredging would be restricted to non-agitation suction type dredging and would be used only in off-channel areas (such as HMU irrigation intakes). The time of year and other fish exclusion techniques and would substantially limit impacts to endangered salmon and steelhead.

Dredging and disposal would cause temporary and localized impacts by increasing turbidity and suspended solids. However, although dredging operations may create a detectable plume extending 1,000 feet (304.8 m) downstream, operations causing a 5-nephalometric turbidity unit (NTU) increase over background (10 percent increase when background is over 50 NTU's) at a point 300 feet (91.4 m) downstream would not be allowed. Background turbidities in the lower Snake River reservoirs and McNary reservoir, generally do not exceed 10 NTU's. Van Oosten (1945) concluded from a literature survey that average turbidities as high as 200 NTU's are harmless to fish. Based on the disparity between the turbidity increases anticipated as part of the

dredging and disposal operation and the levels reported to be harmful to fish, it is determined that the dredging and disposal operations would not effect salmon and steelhead as a result of increased turbidity.

Dredging and disposal will not cause impacts to water temperature or dissolved oxygen because most activity will take place in cold weather during the in-water work window.

Because no in-water work would occur with activities associated with the proposed levee raise at Lewiston, Idaho, no impacts to any listed anadromous species are anticipated. In addition, Essential Fish Habitat for the listed species occurring in the levee area will not be impacted.

3.1 Endangered Species

3.1.1 Snake River Sockeye Salmon (*Oncorhynchus nerka*)

3.1.1.1 Habitat Requirements/Population Status

Snake River sockeye salmon were listed as endangered in November 1991 and are unique in that they are the only species of Pacific salmon that depends on higher elevation tributary lakes in the Salmon River subbasin of Idaho for spawning and rearing (Gustafson et al., 1997).

The McNary reservoir and the lower Snake River corridor are designated as Critical Habitat for migration passage of wild Snake River sockeye salmon. Critical Habitat attributes and EFH components for potential rearing or overwintering for Snake River sockeye salmon are not present in the McNary reservoir, lower Snake River corridor, or any of the proposed project areas. The components of designated Critical Habitat and EFH for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for sockeye salmon is present in the proposed project area. Therefore, no individuals should use the dredging activity areas of the Columbia, Snake or Clearwater Rivers for rearing, feeding, or overwintering during the designated in-water work period or in off-channel areas when water temperatures exceed 70 °F (21.1 °C).

3.1.1.2 Known Occurrences in Project Vicinity

No adult or juvenile wild Snake River sockeye salmon should be present in the main stem Columbia, Snake, or Clearwater Rivers in late December, January, or February or in off-channel areas during late July through September when water temperatures exceed 70 °F (21.1 °C). Work conducted in November 2002 at the Joso site would also not be expected to impact sockeye. Wild Snake River juvenile sockeye salmon generally migrate downriver during April and May and wild adult sockeye salmon are not typically counted at Ice Harbor Dam before June or after October (Corps Annual Fish Passage Reports, 1980-2000).

3.1.1.3 Effects of the Action

The proposed actions for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have no discernable effect on the Snake River sockeye salmon stock, because

none of this stock should be present in the Columbia, Snake, or Clearwater Rivers during the winter in-water work window, in November at the Joso site, or in off-channel areas when water temperatures exceed 70 °F (21.1 °C). There should be no effect on individuals of the sockeye salmon stock through alterations of Critical Habitat caused by dredging, because this stock uses the proposed dredging areas primarily as migration corridors.

3.1.1.4 Conservation Measures

Sockeye salmon are not likely to be in the vicinity of the dredging and disposal operation during the seasons of dredging. However, in light of the type of dredging to be used (i.e., primarily mechanical), the tendency for fish to move away from disturbances, and the general lack of effect anticipated as a result of turbidity increases, no conservation measures are proposed.

3.1.1.5 Determination of Effect

Dredging and disposal operations proposed for the 20-year life of the DMMP/EIS will occur during periods that sockeye salmon would not likely be present. Thus, it is determined that the dredging and disposal operations "*may affect but are not likely to adversely affect*" sockeye salmon. Similarly, the specific activities proposed for the 2002-2003 dredging (table F-8a) "*may affect but are not likely to adversely affect*" sockeye salmon.

In the event that sockeye salmon production increases under the NMFS 2000 Biological Opinion, the passage dates for adult sockeye salmon would be similar to historical trend data. In addition, there should be no discernable effect on individuals of these stocks through alterations of Critical Habitat caused by dredging because these stocks use the proposed dredging areas primarily as migration corridors.

Table F-8a. Effects on Snake River Sockeye Salmon by Life History Stage and by Dredged Material Removal Location for 2002-2003 Proposed Dredging Operation.

Site Number *	*O. nerka* egg to smolt	*O. nerka* smolt	*O. nerka* adult passage	*O. nerka* adult spawning
1	OW NoE R NoE	NAA	NAA	NoE
2a	OW NoE R NoE	NAA	NAA	NoE
2b	OW NoE R NoE	NAA	NAA	NoE
3a	OW NoE R NoE	NAA	NAA	NoE
3b	OW NoE R NoE	NAA	NAA	NoE
3c	OW NoE R NoE	NAA	NAA	NoE
3d	OW NoE R NoE	NAA	NAA	NoE
3e	OW NoE R NoE	NAA	NAA	NoE
4a	OW NoE R NoE	NAA	NAA	NoE
4b	OW NoE R NoE	NAA	NAA	NoE
4c	OW NoE R NoE	NAA	NAA	NoE
5	OW NoE R NoE	NAA	NAA	NoE
6	OW NoE R NoE	NAA	NAA	NoE
7	OW NoE R NoE	NAA	NAA	NoE

Notes:

O. nerka = Snake River sockeye salmon
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.1.2 Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*)

3.1.2.1 Habitat Requirements/Population Status

The McNary reservoir is designated as Critical Habitat for migration passage of wild Upper Columbia River Spring-Run Chinook Salmon, which were listed as endangered in March 1999. Designated Critical Habitat and EFH for potential rearing, overwintering, or resting during juvenile migration may be present in the McNary reservoir project areas for Upper Columbia River Spring-Run Chinook Salmon between mid-March and mid-June when water temperature does not exceed 70 °F (21.1 °C). No spawning habitat is present in the proposed project area. This ESU is an upriver stock.

3.1.2.2 Known Occurrences in Project Vicinity

A few individuals (less than 20) of undetermined origin of spring chinook salmon have been documented as using backwater areas of the McNary reservoir for rearing, feeding, or overwintering (Easterbrooks, 1995, 1996, 1997, 1998) during the period sampled (mid-March through July). Although sampling has not occurred during the cooler water months, it is feasible and probable that individuals of Upper Columbia River Spring-Run Chinook Salmon could use backwater areas of the McNary reservoir for periods of overwintering during the in-water work window.

3.1.2.3 Effects of the Action

The proposed actions in the McNary reservoir for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have little discernable effect on the Upper Columbia River Spring-Run Chinook Salmon stock and actions in the lower Snake River should have no effect. Few individuals of this stock should be present in the Columbia River and none in the Snake River during the winter in-water work window or in off-channel areas when water temperatures exceed 70 °F (21.1 °C). There should be little to no effect on individuals of this chinook salmon stock through alterations of Critical Habitat caused by dredging because this stock uses the proposed dredging areas primarily as migration corridors.

3.1.2.4 Conservation Measures

Chinook salmon are not likely to be in the vicinity of the dredging and disposal operation during the seasons of dredging. However, in light of the type of dredging to be used (i.e., primarily mechanical), the tendency for fish to move away from disturbances, and the general lack of effect anticipated as a result of turbidity increases, no conservation measures are proposed.

3.1.2.5 Determination of Effect

Determination of effect depends upon the water body in which the dredging and disposal activities take place. Dredging and disposal operations in the Snake River proposed for the 20-year life of the DMMP/EIS will occur during periods that Columbia River chinook salmon would not likely be present. Thus, it is determined that the dredging and disposal operations in the Snake River will have *"no effect"* on Columbia River chinook salmon. However, due to possible overwintering behavior in backwater areas of the main stem Columbia, operations in McNary reservoir *"may affect, and are likely to adversely affect"* Upper Columbia River Spring-Run Chinook Salmon. Similarly, the specific activities proposed in McNary Reservoir for the 2002-2003 dredging (table F-8b) *"may affect, and are likely to adversely affect"* Upper Columbia River Spring-Run Chinook Salmon.

In the event that chinook salmon production increases under the NMFS 2000 Biological Opinion, the passage dates for adult chinook salmon would be similar to historical trend data. In addition, there should be no discernable effect on individuals of these stocks through alterations of Critical Habitat caused by dredging because these stocks use the proposed dredging areas primarily as migration corridors.

Table F-8b. Effects on Upper Columbia Basin Spring-Run Chinook Salmon by Life History Stage and by Dredged Material Removal Location for 2002-2003 Proposed Dredging Operation.

Site Number *	*O. tshaw* egg to smolt				*O. tshaw* smolt	*O. tshaw* adult passage	*O. tshaw* adult spawning
1	OW	NoE	R	NoE	NoE	NoE	NoE
2a	OW	NoE	R	NoE	NoE	NoE	NoE
2b	OW	NoE	R	NoE	NoE	NoE	NoE
3a	OW	NoE	R	NoE	NoE	NoE	NoE
3b	OW	NoE	R	NoE	NoE	NoE	NoE
3c	OW	NoE	R	NoE	NoE	NoE	NoE
3d	OW	NoE	R	NoE	NoE	NoE	NoE
3e	OW	NoE	R	NoE	NoE	NoE	NoE
4a	OW	NoE	R	NoE	NoE	NoE	NoE
4b	OW	NoE	R	NoE	NoE	NoE	NoE
4c	OW	NoE	R	NoE	NoE	NoE	NoE
5	OW	NoE	R	NoE	NoE	NoE	NoE
6	OW	NoE	R	NoE	NoE	NoE	NoE
7	OW	AA	R	AA	NoE	NoE	NoE

Notes:

O. tshaw = Upper Columbia River Spring-Run Chinook salmon
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.1.3 Upper Columbia River Steelhead (*Oncorhynchus mykiss*)

3.1.3.1 Habitat Requirements/Population Status

The McNary reservoir is designated as Critical Habitat for migration passage of wild Upper Columbia River Steelhead, which were listed as endangered in August 1997. Designated Critical habitat and EFH for potential rearing, overwintering, or resting during juvenile migration may be present in the McNary reservoir project areas for Upper Columbia River Steelhead between mid-March and mid-June when water temperature does not exceed 70 °F (21.1 °C). No spawning habitat is present in the proposed project area. This ESU is an upriver stock.

3.1.3.2 Known Occurrences in Project Vicinity

No stock of steelhead have been documented as using the backwater areas of the McNary reservoir for rearing, feeding, or overwintering (Easterbrooks, 1995, 1996, 1997, 1998) during the period sampled (mid-March through July). Although sampling has not occurred during the cooler water months, it is feasible and probable that individuals of Upper Columbia River Steelhead could use backwater areas of the McNary reservoir for periods of overwintering during the in-water work window.

3.1.3.3 Effects of the Action

The proposed actions in the McNary reservoir for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have little discernable effect on the Upper Columbia River Steelhead stock and actions in the lower Snake River should have no effect. Few juvenile individuals of this stock should be present in the Columbia River and none in the Snake River during the winter in-water work window or in off-channel areas when water temperatures exceed 70 °F (21.1 °C). Adults of this stock, however, may be using these areas during the in-water work window. There should be little effect on individuals of this steelhead stock through alterations of Critical Habitat caused by dredging because this stock uses the proposed dredging areas primarily as migration corridors.

3.1.3.4 Conservation Measures

Steelhead may be in the vicinity of the dredging and disposal operation during the periods designated for dredging. However, in light of the type of dredging to be used (i.e., primarily mechanical), the tendency for fish to move away from disturbances, and the general lack of effect anticipated as a result of turbidity increases, no conservation measures are proposed.

3.1.3.5 Determination of Effect

Determination of effect depends upon the water body in which the dredging and disposal activities take place. Dredging and disposal operations in the Snake River proposed for the 20-year life of the DMMP/EIS will occur during periods that Upper Columbia River Steelhead would not likely be present. Thus, it is determined that the dredging and disposal operations in the Snake River will have *"no effect"* on Upper Columbia River Steelhead. However, due to possible overwintering behavior for both juveniles and adults in areas of the main stem Columbia, operations in McNary reservoir *"may affect, and are likely to adversely affect"* Upper Columbia River Steelhead. Similarly, the specific activities proposed in McNary Reservoir for the 2002-2003 dredging (table F-8c) *"may affect, and are likely to adversely affect"* Upper Columbia River Steelhead.

In the event that steelhead production increases under the NMFS 2000 Biological Opinion, the passage dates for adult steelhead would be similar to historical trend data. In addition, there should be no discernable effect on individuals of these stocks through alterations of Critical Habitat caused by dredging because these stocks use the proposed dredging areas primarily as migration corridors.

Table F-8c. Effects on Upper Columbia Basin Steelhead by Life History Stage and by Dredged Material Removal Location for 2002-2003 Proposed Dredging.

Site Number *	*O. mykiss* egg to smolt				*O. mykiss* smolt	*O. mykiss* adult passage	*O. mykiss* adult spawning
1	OW	NoE	R	NoE	NoE	NoE	NoE
2a	OW	NoE	R	NoE	NoE	NoE	NoE
2b	OW	NoE	R	NoE	NoE	NoE	NoE
3a	OW	NoE	R	NoE	NoE	NoE	NoE
3b	OW	NoE	R	NoE	NoE	NoE	NoE
3c	OW	NoE	R	NoE	NoE	NoE	NoE
3d	OW	NoE	R	NoE	NoE	NoE	NoE
3e	OW	NoE	R	NoE	NoE	NoE	NoE
4a	OW	NoE	R	NoE	NoE	NoE	NoE
4b	OW	NoE	R	NoE	NoE	NoE	NoE
4c	OW	NoE	R	NoE	NoE	NoE	NoE
5	OW	NoE	R	NoE	NoE	NoE	NoE
6	OW	NoE	R	NoE	NoE	NoE	NoE
7	OW	AA	R	AA	NoE	AA	NoE

Notes:

O. mykiss = Upper Columbia River Steelhead
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.2. Threatened Species

3.2.1 Snake River Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha*)

3.2.1.1 Habitat Requirements/Population Status

The lower Snake River and McNary Reservoir corridor is designated Critical Habitat for migration passage of wild Snake River Fall-Run Chinook Salmon, which were listed as threatened in April 1992. Critical Habitat attributes and EFH components suitable for potential rearing, overwintering, and migration passage for Snake River Fall-Run Chinook Salmon are present in the proposed project area. Very restricted spawning habitat for wild Snake River Fall-Run Chinook Salmon is present in the proposed project area.

Juvenile Snake River Fall-Run Chinook Salmon use shallow, open water, sand substrate in backwater-type and opposing bar habitat areas for rearing periods during their out-migration. These fish tend to out-migrate as subyearlings during their year of emergence over a period of weeks or months, feeding and growing as they progress downriver (Bennett et al., 1997).

This ESU is comprised of a stock with a main stem spawning lifestyle; and a few individuals could use the dredging activity areas of the Snake or Clearwater Rivers for rearing, feeding, or overwintering during the winter of the designated in-water work period or in November during work at the Joso site. Fall chinook salmon would not be expected to be present in off-channel

areas when water temperatures exceeded 70 °F (21.1 °C) should work occur during late July through September.

3.2.1.2 Known Occurrences in Project Vicinity

The wild juvenile fall chinook salmon typically pass mid-June through September, with double peaks in mid-July and some lingering portion of the annual migration population lasting until December. Many of the juvenile fall chinook salmon out-migrating from the Clearwater and Snake Rivers spend time in shoreline areas [less than 9.8 feet (3 m) in depth] in Lower Granite reservoir and less time in downriver reservoirs, where they prefer sand-substrate areas (Curet, 1994; Bennett et al., 1997). When water temperatures reach about 70 °F (21.1 °C), these fish appear to have achieved adequate growth and fitness due to the warming conditions of these shallow water habitat areas and leave the shoreline areas to either continue rearing and/or begin their migration in the cooler pelagic zone of the reservoirs (Bennett et al., 1997).

The PIT-tag detections of 1993-1995 brood year juvenile fall chinook salmon from the Clearwater River were recorded in the spring of 1994-1996 at some lower Snake River dams (Kenney, 1996). It is unknown whether these fish overwintered in the free-flowing Clearwater River or in one or more of the lower Snake River reservoirs. More PIT-tagged chinook out-migrants were detected in the spring of 1994 and 1995 than in the previous summer/fall, while the trend was reversed with the 1995 brood year. It is apparent from these detections that some Clearwater River fall chinook salmon migrate to the ocean as yearlings, rather than as subyearlings. Cold-water releases from Dworshak dam, aimed at augmenting flows for adult in-migration, may cause stunted growth rates in juveniles in the late summer and early fall, causing these fish to overwinter. The Corps is unaware of information on the extent of overwintering of juvenile fall chinook in the Clearwater River, but has no reason to believe that overwintering in the area of the proposed dredging is a common occurrence or behavior. Overwintering of fall chinook in McNary reservoir backwater areas is expected; however, differentiation between Snake River and Columbia River stocks may preclude confirmation.

Adult wild Snake River Fall-Run Chinook Salmon migrate through the Snake River from late summer to early winter with spawning activity not beginning until mid-October (Connor et al., 1994). Little spawning habitat is present in the proposed dredging areas, except the possibility of limited fall chinook spawning in the tailrace areas of the lower Snake River dams (Dauble et al., 1998). Spawning of fall chinook salmon has been known to occur in Little Goose, Lower Monumental, and Ice Harbor reservoirs, but only in tailwater areas directly downstream of the dams' bypass outfalls, where water velocity is high and substrate size is relatively large (Dauble et al., 1995 and 1996). Proposed dredging in the designated navigation channels in the tailwaters of the lower Snake River dams has a low probability of excavating redds. A few redds had previously been located using a GIS-directed field monitoring evaluation conducted between 1994 and 1998. No redds have been located in the tailrace areas downriver of the navigation lock approaches at Lower Granite or Lower Monumental since 1994; however, redds have been found downstream of Little Goose and Ice Harbor dams as recently as 1997 and 1996, respectively, although not in areas proposed for dredging (Dauble et al., 1995, 1996, and 1998). The low velocity and relatively fine substrate input to the upper reaches of Lower Granite reservoir preclude spawning in the confluence area.

No adult Snake River Fall-Run Chinook Salmon stock should be in the project area in late December, January, or February and adult fall chinook would not be expected to use off-channel areas in late July through September when water temperatures exceed 70 °F (21.1 °C). Although adults may be in the vicinity of the Joso barge slip site in November, this specific area is neither a migratory corridor nor a spawning area and few, if any, impacts to fall chinook adults would be anticipated. These fish migrate to the Snake and Clearwater Rivers from late summer to early winter, and all spawning activity should be completed by mid-December (Connor et al., 1994). Currently, habitat from Snake RM 148.3 to RM 246.5, upstream from the confluence area, is annually surveyed for fall chinook salmon redds through December by the USFWS Fisheries Resource Office in Ahsaka, ID (Garcia et al., 1999). No evidence of fall chinook salmon spawning has been found in the Snake River below RM 144 (Garcia et al., 1999). The nearest redd location was a single redd in 1990 at Snake RM 148.3.

3.2.1.3 Effects of the Action

Placement of the dredged material in the shallow/mid-depth sites in the lower Snake River reservoirs beginning with the Knoxway Canyon site is expected to be beneficial to salmon. Criteria for beneficial use of dredged material based on the size of material placed and the depth of placement was developed based on the research and monitoring recommendations of Dr. David Bennett, a researcher at the University of Idaho, who conducted monitoring studies regarding the effects of in-water disposal in the Lower Granite reservoir. Dr. Bennett's team found that sediments consisting of at least 80 percent sand 0.008 inch (0.21 mm) in diameter or larger is the preferred substrate for juvenile salmon. A depth of 20 feet (6.1 m) to define the boundary between mid-elevation depth and shallower water was determined based upon typical limits of the photic zone conducive for primary and secondary productivity of food web constituents, as well as preferred depths of open sandy bench habitat important for juvenile fall chinook rearing (Bennett et al., 1993a, 1993b, 1995a, 1997; Curet, 1994; Connor et al., 1994; Rondorf and Miller, 1994).

Wild Snake River fall chinook salmon typically out-migrate as subyearlings in the spring and summer of their emergence year. Based on the typical Snake River fall chinook salmon out-migration pattern, few or no juvenile chinook salmon should be present in the project areas during the dredging and disposal period of the in-water work windows. Also, few or no juvenile chinook salmon should be present either at the Joso barge slip site during November operations or in off-channel areas of the Snake and Columbia Rivers when water temperatures exceed 70 °F (21.1 °C).

Critical fish habitat in the lower Snake River will be marginally affected by the dredging operations. Although the Corps knows of no standard definition of shoreline or shallow-water habitat other than depth and substrate and slope characteristics, the Corps does not believe that dredging would lessen the amount of this habitat available to juvenile fall chinook salmon. All dredging would be no more than 16 feet (4.9 m) below the minimum operating reservoir elevation and most of the dredging would be in areas where only a few feet of sediment would be removed. Even after removal attempts, some sandy substrate would likely remain in the dredged areas. Benthic organisms in the dredged areas would be removed but the benthic community should quickly re-establish in the dredged areas (4 to 6 months, Bennett and Shrier, 1987;

Bennett et al., 1991 and 1997). The Corps anticipates that the habitat quality at the proposed disposal areas will be greatly enhanced by placing dredged material to create shallow water, sand benches, benefiting Snake River subyearling fall Chinook salmon.

3.2.1.4 Conservation Measures

Refer to Section 6.0 - Recommended Conservation Measures.

3.2.1.5 Determination of Effect

The Corps believes that most life stages of the Snake River fall chinook salmon stock would be either unaffected or benefited by enhancing shallow water rearing habitat along the shorelines. At the proposed disposal sites in the lower Snake River reservoirs, the mid-depth bottom elevations would be raised to provide shallow water conditions.with water depths of 10 to 20 feet (3.0 to 6.1 m). The resultant acreage of open, sandy shallow water habitat should result in increased diversity of physical habitat and forage species preferred by rearing subyearling chinook salmon. Simultaneously, it would decrease habitat suitability for rearing of predator species such as smallmouth bass and northern pike minnow.

The Corps also believes that most life stages of the Snake River fall chinook salmon stock would be unaffected by habitat alteration within the project area, which is primarily used as a migratory corridor for juvenile and adult fall chinook.

It has been determined that dredging proposed for the 20-year life of the DMMP/EIS in McNary reservoir, and the lower Snake and Clearwater Rivers during the winter period of operation; at Joso in November; and in off-channel locations where water temperatures seasonally exceed 70 °F (21.1 °C), *"may affect, and are likely to adversely affect"* wild Snake River fall chinook salmon. This determination is based on the increasing potential for juveniles to overwinter in the confluence and shallow shoreline areas and is supported by recent PIT-tag analysis, delayed growth evaluations, and seine capture data dating back to the early 1990's. Similarly, the specific activities proposed in the project area for the 2002-2003 dredging (table F-8d) *"may affect, and are likely to adversely affect"* Snake River Fall-Run Chinook Salmon.

Table F-8d. Effects on Snake River Fall-Run Chinook Salmon by Life History Stage and by Dredged Material Removal Location for 2002-2003 Proposed Dredging.

Site Number*	Fall Ch egg to smolt	Fall Ch Smolt	Fall Ch adult passage	Fall Ch adult spawning
1	OW AA R AA	NAA	NAA	NAA
2a	OW AA R AA	NAA	NoE	NoE
2b	OW AA R AA	NAA	NoE	NoE
3a	OW AA R AA	NAA	NoE	NoE
3b	OW AA R AA	NAA	NoE	NoE
3c	OW AA R AA	NAA	NoE	NoE
3d	OW AA R AA	NAA	NoE	NAA
3e	OW AA R AA	NAA	NoE	NAA
4a	OW AA R AA	NAA	NoE	NoE
4b	OW AA R AA	NAA	NoE	NoE
4c	OW AA R AA	NAA	NoE	NoE
5	OW AA R AA	NAA	NAA	NoE
6	OW AA R AA	NAA	NoE	NoE
7	OW AA R AA	NAA	NoE	NoE

Notes:

F Ch = Snake River fall chinook salmon
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.2.2 Snake River Spring/Summer-Run Chinook Salmon (*Oncorhynchus tshawytscha*)

3.2.2.1 Habitat Requirements/Population Status

The Snake River supports spring/summer chinook salmon, which were listed as threatened in April 1992. The lower Snake River and McNary reservoir corridors are designated Critical Habitat for migration passage of wild Snake River Spring/Summer-Run Chinook Salmon. Critical Habitat attributes and EFH components suitable for potential rearing or overwintering for Snake River Spring/Summer-Run Chinook Salmon are likely present in the proposed project areas during the winter in-water work window and in November at the Joso site. No suitable habitat would be available in off-channel areas at water temperatures higher than 70 °F (21.1 °C). The components of designated Critical Habitat and EFH for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for wild Snake River Spring/Summer-Run Chinook Salmon is present in the proposed project area. This ESU is comprised of a stock with an upriver spawning lifestyle that uses accessible tributary stream habitat at higher elevations in predominantly the Salmon, Imnaha, and Grande Ronde Rivers subbasins for spawning and rearing. Therefore, few individuals should use the dredging activity areas of the Snake or Clearwater Rivers during the winter of the designated in-water work period for rearing, feeding, or overwintering. The wild spring chinook salmon stock originally produced in the Clearwater River has been extirpated. The existing Clearwater River spring chinook salmon are hatchery derived without ESA status or protection.

3.2.2.2 Known Occurrences in Project Vicinity

A few individuals (less than 20) of undetermined origin of spring chinook salmon have been documented as using the backwater areas of McNary reservoir for rearing, feeding, or overwintering (Easterbrooks, 1995, 1996, 1997, 1998) during the period sampled (mid-March through July). Although sampling has not occurred during the cooler water months, it is feasible and probable that individuals of Snake River Spring/Summer-Run Chinook Salmon could use the backwater areas of McNary reservoir for periods of overwintering or rearing between July and March. Because this ESU is upriver stock, no spawning habitat is present in the proposed project area.

Few wild Snake River Spring/Summer-Run Chinook Salmon should be found in the project areas during the proposed in-water work. No wild adult or juvenile Snake River Spring/Summer-Run Chinook Salmon should be present at the confluence of the Snake and Clearwater Rivers in late December, January, or February. Wild adult Snake River Spring/Summer-Run Chinook Salmon pass through the lower Snake River project area between April and mid-August. Therefore, few, if any, spring/summer chinook salmon would be expected at the Joso barge slip site in November or in backwater areas of the Snake and Columbia Rivers during the in-water work window. Wild juvenile Snake River Spring/Summer-Run Chinook Salmon generally migrate down through the project area during March through July; however, a few fish could be expected in backwater areas in the proposed work areas. No spring/summer chinook salmon should be present in off-channel areas during late July through September when water temperatures exceed 70 °F (21.1 °C).

3.2.2.3 Effects of the Action

The proposed actions for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have no discernable effect on the wild Snake River Spring/ Summer-Run Chinook Salmon stocks because few juvenile individuals of this stock should be present in the Columbia, Snake, or Clearwater Rivers during November or the winter in-water work windows. Off-channel areas are expected to exclude this species seasonally when water temperatures exceed 70 °F (21.1 °C) but may hold overwintering fish. There should be no effect on individuals of the wild Snake River Spring/Summer-Run Chinook Salmon stock through alterations of Critical Habitat caused by dredging because this stock uses the proposed dredging areas primarily as migration corridors.

Placement of dredged material beginning with the shallow/mid-depth site at Knoxway Canyon in 2002 is expected to be most beneficial to Snake River fall chinook salmon, but increased production of macroinvertebrates as prey could also benefit migrating Snake River spring/summer chinook salmon.

Wild juvenile Snake River Spring/Summer-Run Chinook Salmon out-migrate as yearlings in the next spring following their emergence year. Based on the typical Snake River Spring/Summer-Run Chinook Salmon out-migration pattern, few or no juvenile chinook salmon should be present in the confluence of the Snake and Clearwater Rivers or the previously dredged tailwater

area below the Lower Granite or Lower Monumental navigation lock guide walls during the dredging period.

3.2.2.4 Conservation Measures

Refer to Section 6.0 - Recommended Conservation Measures.

3.2.2.5 Determination of Effect

Although dredging and disposal operations proposed for the 20-year life of the DMMP/EIS will occur during a time of year that very few wild Snake River Spring/Summer-Run Chinook Salmon stocks may be present, it is determined that the dredging and disposal operations "*may affect and are likely to adversely affect*" Snake River Spring/Summer-Run Chinook Salmon due to the potential for this stock to overwinter in backwater areas during the in-water work window. Similarly, the specific activities proposed in McNary reservoir for the 2002-2003 dredging (table F-8e) "*may affect, and are likely to adversely affect*" Snake River Spring/Summer-Run Chinook Salmon.

In the event that wild Snake River Spring/Summer-Run Chinook Salmon production increases under the NMFS 2000 Biological Opinion, the passage dates for adult spring/summer chinook salmon would be similar to historical trend data. In addition, there should be no discernable effect on individuals of these stocks through alterations of Critical Habitat caused by dredging because these stocks use the proposed dredging areas primarily as migration corridors.

Table F-8e. Effects on Snake River Spring/Summer-Run Chinook Salmon by Life History Stage and by Dredged Material Removal Location for Year 1 Proposed Dredging Operation.

Site Number *	S/S Ch egg to smolt	S/S Ch smolt	S/S Ch adult passage	S/S Ch adult spawning
1	OW AA R AA	NAA	NAA	NoE
2a	OW AA R AA	NAA	NAA	NoE
2b	OW AA R AA	NAA	NAA	NoE
3a	OW AA R AA	NAA	NAA	NoE
3b	OW AA R AA	NAA	NAA	NoE
3c	OW AA R AA	NAA	NAA	NoE
3d	OW AA R AA	NAA	NAA	NoE
3e	OW AA R AA	NAA	NAA	NoE
4a	OW AA R AA	NAA	NAA	NoE
4b	OW AA R AA	NAA	NAA	NoE
4c	OW AA R AA	NAA	NAA	NoE
5	OW AA R AA	NAA	NAA	NoE
6	OW AA R AA	NAA	NAA	NoE
7	OW AA R AA	NAA	NAA	NoE

Notes:

S/S Ch = Snake River Spring/Summer-Run Chinook Salmon
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.2.3 Snake River Basin Steelhead (*Oncorhynchus mykiss*)

3.2.3.1 Habitat Requirements/Population Status

The lower Snake River supports wild Snake River Basin Steelhead, which were listed as threatened on October 17, 1997. The lower Snake River corridor and McNary reservoir are designated Critical Habitat for migration passage of wild Snake River Basin Steelhead. Critical Habitat attributes and EFH components suitable for potential rearing or overwintering for Snake River Basin Steelhead are likely present in the proposed project area. The components of designated Critical Habitat and EFH for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for wild Snake River Basin Steelhead is present in the proposed project area. This ESU is comprised of a stock with an upriver spawning lifestyle that uses accessible tributary stream habitat at higher elevations in predominantly the Clearwater, Salmon, Imnaha, and Grande Ronde Rivers subbasins for spawning and most rearing.

3.2.3.2 Known Occurrences in Project Vicinity

Few individuals of wild adult or juvenile Snake River Basin Steelhead should be present in the project area in late December, January, or February. Wild adult steelhead migrate through the reach between June and August for the A-run and between late August and November for the B-run. Wild adult Snake River Basin B-Run Steelhead migrating to the Middle and South Forks

of the Salmon River for spawning in March through May could be present in main stem channels adjacent to the project area during the time of dredging activities. Adults from this stock may be migrating in deeper water or individuals may be holding in mid-channel reservoirs prior to moving upriver into tributaries for spawning in early spring.

Wild juvenile Snake River Basin Steelhead generally migrate down through the lower Snake River mostly between late March and the end of August. Few wild steelhead are expected to be present at the Joso barge slip site in November.

Because some rearing or overwintering may occur in the confluence area of the lower Snake and Clearwater Rivers, an unknown number of individuals could use the dredging activity areas of the Snake or Clearwater Rivers for rearing, feeding, or overwintering during the designated in-water work period or in November during work at the Joso barge slip. However, no steelhead would be expected to be present in off-channel dredging areas when water temperatures exceed 70 °F (21.1 °C).

3.2.3.3 Effects of the Action

The proposed actions for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have negligible effects on the wild Snake River Basin Steelhead stocks because few individuals of this stock should be present in the Columbia, Snake, or Clearwater Rivers during the winter in-water work window or in November. Wild steelhead should not be present at off-channel areas when water temperatures exceed 70 °F (21.1 °C) during the potential late July-September season. There could be minor effects on individuals of the wild Snake River Basin Steelhead stock through alterations of Critical Habitat caused by dredging because, although this stock uses the proposed dredging areas primarily as migration corridors, some evidence indicates that the proposed dredging and disposal sites may serve as overwintering habitat.

Placement of dredged material beginning with the shallow/mid-depth site at Knoxway Canyon in 2002 is expected to be most beneficial to Snake River fall chinook salmon, but increased production of macroinvertebrates as prey could also benefit migrating Snake River Basin Steelhead.

Wild juvenile Snake River Basin Steelhead out-migrate in the second or third spring following their emergence year. Based on the typical Snake River Basin steelhead out-migration pattern, few juveniles should be present in the project area during the dredging period.

By the time the dredging operation begins in mid-December, the peak of steelhead fishing season should have passed and, typically, winds down by the first of January. This indicates that the winter dredging operation should have a minor impact on adult Snake River Basin Steelhead.

3.2.3.4 Conservation Measures

Refer to Section 6.0 - Recommended Conservation Measures.

3.2.3.5 Determination of Effect

Dredging and disposal operations in the project area proposed for the 20-year life of the DMMP/EIS will occur during periods that Snake River Basin Steelhead may be present. Due to possible overwintering behavior for both juveniles and adults in the project area, dredging activities "*may affect, and are likely to adversely affect*" Snake River Basin Steelhead. Similarly, the specific activities proposed in the project area for the 2002-2003 dredging (table F-8f) "*may affect, and are likely to adversely affect*" Snake River Basin Steelhead.

In the event that steelhead production increases under the NMFS 2000 Biological Opinion, the passage dates for adult steelhead would be similar to historical trend data. In addition, there should be no discernable effect on individuals of these stocks through alterations of Critical Habitat caused by dredging because these stocks use the proposed dredging areas primarily as migration corridors.

Table F-8f. Effects on Snake River Basin Steelhead by Life History Stage and by Dredged Material Removal Location for Year 1 Proposed Dredging Operation.

Site Number *	SSTHD egg to smolt	SSTHD smolt	SSTHD adult passage	SSTHD adult spawning
1	OW AA R AA	NAA	AA	NoE
2a	OW AA R AA	NAA	NAA	NoE
2b	OW AA R AA	NAA	NAA	NoE
3a	OW AA R AA	NAA	NAA	NoE
3b	OW AA R AA	NAA	NAA	NoE
3c	OW AA R AA	NAA	NAA	NoE
3d	OW AA R AA	NAA	NAA	NoE
3e	OW AA R AA	NAA	NAA	NoE
4a	OW AA R AA	NAA	NAA	NoE
4b	OW AA R AA	NAA	NAA	NoE
4c	OW AA R AA	NAA	NAA	NoE
5	OW AA R AA	NAA	NAA	NoE
6	OW AA R AA	NAA	NAA	NoE
7	OW AA R AA	NAA	NAA	NoE

Notes:

SSTHD = Snake River Basin Steelhead
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.2.4 Middle Columbia River Steelhead (*Oncorhynchus mykiss*)

3.2.4.1 Habitat Requirements/Population Status

The middle Columbia River supports wild Columbia River Basin Steelhead, which were listed as threatened in March 1999. The lower and middle Columbia River corridor is designated Critical Habitat for migration passage of wild Columbia River Basin Steelhead *(Federal Register, February 5, 1999, Volume 64, Number 24)*. Critical Habitat attributes and EFH components

suitable for potential rearing or overwintering for Columbia River Basin Steelhead are likely present in the middle Columbia River corridor and the proposed project areas. The components of designated Critical Habitat and EFH for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for wild Columbia River Basin Steelhead is present in the proposed project area. This ESU is comprised of a stock with an upriver spawning lifestyle that uses accessible tributary stream habitat at higher elevations in predominantly the Walla Walla and Yakima River subbasins for spawning and most rearing. Because some rearing or overwintering may occur in the confluence area of the lower Walla Walla and Columbia Rivers, an unknown number of individuals could use the dredging activity areas of the Columbia River during the designated in-water work period for rearing, feeding, or overwintering.

3.2.4.2 Known Occurrences in Project Vicinity

The Walla Walla River steelhead population is composed of predominantly wild fish. Wild Middle Columbia River Steelhead smolts out-migrate between April and May and the adult summer run in-migrates between December and June, with peak passage during March and April. Based on observation, the Oregon Department of Fish and Wildlife (ODFW) speculates that steelhead overwinter in the middle to lower Walla Walla River. However, they could continue to move slowly downriver or swim straight to the lower Columbia River as the spring freshets act to transport them downriver in April and May. It is documented by ODFW creel survey data and angler interviews that river conditions have allowed steelhead to arrive as early as November 1 and as late as July 30 for smaller steelhead. Summer steelhead pre-smolts migrate out of the headwaters when flows allow in the fall or winter.

3.2.4.3 Effects of the Action

The proposed actions in the McNary reservoir for the 20-year life of the DMMP/EIS, including the proposed 2002-2003 activities, should have little discernable effect on the Middle Columbia River Steelhead stock and actions in the lower Snake River should have no effect. Few juvenile individuals of this stock should be present in the Columbia River and few should be present in the Snake River during the winter in-water work window or in off-channel areas when water temperatures exceed 70 °F (21.1 °C). Adults of this stock, however, may be using these areas during the in-water work window. There should be little effect on individuals of this steelhead stock through alterations of Critical Habitat caused by dredging because this stock uses the proposed dredging areas primarily as migration corridors.

3.2.4.4 Conservation Measures

Refer to Section 6.0 - Recommended Conservation Measures.

3.2.4.5 Determination of Effect

Dredging and disposal operations in the Snake River proposed for the 20-year life of the DMMP/EIS will occur during periods that Middle Columbia River Steelhead would not likely be present. Thus, it is determined that the dredging and disposal operations in the Snake River

"*may affect, but are not likely to adversely effect*" Middle Columbia River Steelhead. However, due to possible overwintering behavior in backwater areas of the main stem Columbia, operations in McNary reservoir "*may affect, and are likely to adversely affect*" Middle Columbia River Steelhead. Similarly, the specific activities proposed in McNary Reservoir for the 2002-2003 dredging (table F-8g) "*may affect, and are likely to adversely affect*" Middle Columbia River Steelhead.

Table F-8g. Effects on Middle Columbia River Basin Steelhead by Life History Stage and by Dredged Material Removal Location for Year 1 Proposed Dredge Operation.

Site Number *	MCSTHD egg to smolt				MCSTHD smolt	MCSTHD adult passage	MCSTHD adult spawning
1	OW	NoE	R	NoE	NoE	NoE	NoE
2a	OW	NoE	R	NoE	NoE	NoE	NoE
2b	OW	NoE	R	NoE	NoE	NoE	NoE
3a	OW	NoE	R	NoE	NoE	NoE	NoE
3b	OW	NoE	R	NoE	NoE	NoE	NoE
3c	OW	NoE	R	NoE	NoE	NoE	NoE
3d	OW	NoE	R	NoE	NoE	NoE	NoE
3e	OW	NoE	R	NoE	NoE	NoE	NoE
4a	OW	NoE	R	NoE	NoE	NoE	NoE
4b	OW	NoE	R	NoE	NoE	NoE	NoE
4c	OW	NoE	R	NoE	NoE	NAA	NoE
5	OW	NoE	R	NoE	NoE	NAA	NoE
6	OW	NoE	R	NoE	NoE	NAA	NoE
7	OW	AA	R	AA	NAA	AA	NoE

Notes:
MCSTHD = Middle Columbia River Basin Steelhead
OW = overwintering
R = rearing
NAA = Not Likely to Adversely Affect
AA = Likely to Adversely Affect
NoE = No Effect

* See the site listing in table F-5.

3.3 Candidate or Proposed for Listing Species

None.

3.4 Species of Concern

The following species of concern are those listed by the USFWS that may have anadromous life stages either historically or currently and may occur in the vicinity of the proposed project:

- Pacific lamprey *(Lampetra tridentata)*
- White sturgeon *(Acipenser transmontanus)*

Anadromous populations of these species would be of concern to NMFS, several tribes, and the WDFW, but are only included under the purview of NMFS ESA review responsibilities. Analysis of effects could assist in preclusion to future listings under ESA. Of these species or their stocks, only white sturgeon have been widely documented to use the McNary reservoir,

main stem of the lower Snake River, and the confluence of the Clearwater and Snake Rivers for rearing, feeding, or overwintering. Pacific lamprey use the project areas primarily as a migration corridor; however, no surveys have been conducted for rearing ammocoetes. No known or documented spawning habitat is present in the proposed project area for either of the species. No designated Critical Habitat and EFH have been established by NMFS or USFWS for these species and/or their stocks.

3.4.1 Pacific lamprey (*Lampetra tridentata*)

Spawning habitat requirements for Pacific lamprey are similar to those of salmonids, including clean gravel and cold water. After hatching from fertilized eggs, these fish spend about 5 years as ammocoetes (blind filter feeders) and burrow in mud and fine sediments in reservoirs, backwaters, and eddies, downstream from spawning riffles. The ammocoetes migrate slowly downstream, with their movement apparently triggered by high water flow. Between 4 and 6 years of age, ammocoetes metamorphose into adults and become parasitic on soft-scaled fish. The adults migrate to sea, where they remain until they return to fresh water to spawn and die.

Many questions have yet to be answered about Pacific lamprey in the Columbia River basin. Although ammocoetes settle out downstream from spawning riffles, the distance downstream that ammocoetes will drift before settling out and burying into the substrate has not been determined. If drift potential includes a substantial distance and ammocoetes migrate slowly downstream with flow, rearing Pacific lamprey would likely be present in some of the areas proposed for dredging. The primary area of concern would be the confluence of the Snake and Clearwater Rivers.

Although little is known about Pacific lamprey use of the main stem Snake and Columbia Rivers, if the preceding statements prove accurate, most types of dredging could have impacts on rearing Pacific lamprey. Both hydraulic and mechanical methods may entrain juvenile fish and the deposition of material could have the potential to bury fish in the reservoir. Monitoring of dredged material may be required in the future to determine impacts to various life stages of these fish.

3.4.2 White Sturgeon (*Acipenser transmontanus*)

White sturgeon use depths from 20 to 130 feet (6.1 to 39.6 m) with highest catch rates at intermediate depths of 59 to 72 feet (18 to 22 m). Water velocities used by white sturgeon ranged from 0 to 2 feet/second (0.0 to 0.58 meter/second) with a maximum suitability index for mean and near-substrate velocities near 1.2 feet/second (0.38 meter/second). Substrate use was predominantly sand.

Habitat use by white sturgeon in the Lower Granite reservoir indicated a high tolerance of habitat conditions. Catch rates and suitability indices indicated white sturgeon used habitat at the upper end of the Lower Granite reservoir with greater frequency than mid- and lower reservoir transects. These upper areas coincided with higher water velocity, large sand substrate, and shallower depths relative to transects sampled downriver.

Stepwise discriminate analysis of habitat variables indicated that maximum depth, near-substrate water velocity, near-substrate dissolved oxygen concentrations, and sand substrate provide best separation between presence and absence of white sturgeon (Lepla, 1994). However, only 26 percent of the variation between locations classified as present or absent were explained by the habitat variables measured, suggesting other criteria were responsible for white sturgeon distribution in the Lower Granite reservoir, such as prey abundance and availability.

Deep-water areas 76.8 to 159.8 feet (23.4 to 48.7 m) at mid- and lower sections of the Lower Granite reservoir were not considered significant since use of these areas by white sturgeon was markedly lower than at upstream locations. Approximately 77 percent of the white sturgeon collected were in the thalweg with highest catch rates (0.23 to 0.32 fish/hr) at upper reservoir transects (RM 134 and RM 137.3) where maximum depths were less than 75.5 feet (23 m).

Use of thalweg and areas adjacent to the thalweg by white sturgeon were similar between day and night sampling. Seasonal differences in catch rates were not significant for mid- and lower reservoir transects where abundance of white sturgeon was consistently low. Lepla's (1994) study strongly indicates that negative impacts from deep-water sediment disposal would be minimal to white sturgeon if conducted at lower reservoir locations (<RM 120).

4.0 CUMULATIVE EFFECTS

4.1 The PFC Pathways and Indicators

4.1.1 Benthic Invertebrates

The newly placed disposal material may type-convert and enhance the existing marginal-quality rearing habitat along the shoreline. Some benthic invertebrates inhabiting the dredged material will be displaced and colonize the disposal sites. The seasonally productive benthic communities should quickly re-establish with the same species composition and abundance shortly after the effects of construction have subsided and the next growing/production season returns. No additional displacement over seasonal background levels should occur or persist.

4.1.2 Water Quality

Increases in turbidity and debris from equipment operation during removal and disposal of the dredged material should be expected. Any unanticipated impacts due to dredging activities should be minimal, localized, and will be regulated by direct monitoring. The comparison of activity parameter levels against background levels will be done according to the conditions set forth by the Washington Department of Ecology.

Some immeasurable degree of competition for food or predator avoidance can be expected for the short-term few months following construction. This effect may transfer into a slight reduction in the ability of part of the population to successfully produce a high rate of weight gain during the late-spring post-construction activity period. Any permit requirements for water quality certification should also act to directly protect fishery resources that would be present or in the near vicinity.

4.1.3 Habitat Access

The proposed dredged material removal and disposal should pose no effect to impeding access to the migration corridor and/or tributary or backwater-rearing habitat for any listed salmon or steelhead stock.

4.1.4 Habitat Elements

The proposed action of enhancing rearing habitat both quantitatively and qualitatively, and with a better distribution spatially, could have long-term benefits to the anadromous and resident fishery resources within the lower Snake River. No long-term negative impacts are anticipated and the proposed action should increase overall fish population health and abundance. Impacts due to the proposed dredged material removal and disposal activities are expected to be short-term concerns that will be adequately monitored in real-time in accordance with state and federal water quality criteria. Short-term environmental impacts may include mild localized and incremental increases in turbidity and possible organic waste solids and liquids from equipment operation of dredge platforms. Control provisions will be in place to minimize adverse impacts of construction on the environment. Any permit requirements for water quality certification will also act to directly protect fishery resources present in the work area.

Construction activity would involve noise from heavy equipment and human activity. Disturbance to fishery resources should be minimal compared to the existing condition. Biological organisms respond to disturbance either by avoidance or habituation. Short-term disturbance would probably cause temporary avoidance but would have no long-term effects. Species that cannot avoid disturbance may become habituated if they are present near the construction activities.

4.1.4.1 Dredging Sites

The existing habitat suitability for anadromous salmonids at the proposed dredging locations is marginal. In both the confluence area and other sandy areas in the navigation channel, water velocity and the repeated dredging actions performed since 1975 have combined to make this a less preferred habitat for juvenile salmonids. In the backwater areas of the Snake and McNary reservoirs, much of the substrate is silt, which is also a less preferred habitat. Therefore, dredging these areas is not expected to impact the Critical Habitat for these species.

4.1.4.2 Disposal Sites

The proposed in-water disposal sites are currently designated Critical Habitat for all Snake River Basin salmon and steelhead ESU stocks (Federal Register, February 5, 1999, Volume 64, Number 24). Disposal actions would not likely adversely affect any adults or juveniles of these stocks and are expected to have no effect on the Columbia River stocks. The shoreline and shallow water habitat enhancement proposed would not negatively affect the suitability of that habitat for rearing or resting Snake River fall chinook and/or Snake River Basin steelhead. Habitat-dependent early life stages of fall chinook salmon would likely only use the existing mid-depth shoreline area minimally due to previous impacts and type conversion from a

combination of reservoir filling and riprap shoreline protection that directly transitions into open water. Beneficial disposal is designed to increase the quantity, distribution, and quality of rearing habitat sites in the reservoirs for all salmonid species; however, most improvements would primarily benefit fall chinook salmon.

4.1.4.3 Levee Raise

The 3-foot (0.9-m) levee raise in Lewiston, Idaho, will not require any in-water work and is not expected to have any impacts to the aquatic habitat.

4.2 Indirect Effects, Interdependent Effects, or Interrelated Effects

Based on over 10 years of data, all anticipated indirect effects, interdependent effects, or interrelated effects would likely not be significant because they either currently exist in state or are due to the existing human impact regime. The experimentation compiled by Dr. David Bennett and associated University of Idaho research and monitoring, indicate that the previous loss of shoreline sandbar habitat could be mitigated in 10 to 20 years. Dredging of boat basins and access to such basins should provide little increased use in the number of net recreational boats or commercial boating ventures. Since the depth of the navigation channel and all access channels remains relatively shallow at 14 feet (4.3 m) for shallow draft vessels, it is anticipated that very few deeper draft vessels would be capable of utilizing the areas dredged.

The proposed dredging project is the latest in a continuing series of dredging operations to maintain navigation, port, and recreational use of the lower Snake, Clearwater, and Columbia Rivers. The Corps anticipates that dredging will need to continue in the confluence area to remove accumulated sediment and that the DMMP/EIS will be coordinated, reviewed, and completed by the summer of 2001. An LSMG for the lower Snake River and McNary reservoir was formed in July 2000 to coordinate and review future dredging needs, priorities, and activities, especially options for beneficial use disposal. The studies conducted by Dr. Bennett indicate that there may be beneficial uses of the dredged material in the reservoir if certain criteria are followed in the selection and placement of the material.

Proposed in-water disposal sites generally will require several years of dredging and disposal operations to fully establish the acreage of enhanced shallow water habitat for which the full site has capacity. A No Project alternative would result in the site remaining status quo with about 2 inches (5.1 cm) per year of fine sediment accumulating across the bench; thus, no improvement in rearing habitat suitability from the current poor rating. The proposed dredge operation for 2002 would only initiate a trend of establishing sandy shallow water bar type habitat. Considering the cultural resource protection limitations, the potential rearing habitat created may have some structural diversity in bottom geometry without vegetative cover conducive to predator species rearing or hiding. However, it could take 4 to 5 years of dredged material disposal at 200,000 to 300,000 CY (152,911.0 to 229,366.5 m^3) of 80 percent sand per year to fully realize the desired design for highly suitable rearing habitat for Snake River fall chinook salmon. Proposed future dredging designs and schedules will be coordinated within the LSMG formulated for the Corps DMMP/EIS scheduled for completion in summer 2002.

5.0 INCIDENTAL TAKE

The incidental take of endangered anadromous salmonid individuals is expected to be low and to vary by species; however, no major impacts to any of the stocks are expected. No significant adverse effect that could result in Incidental Take of Snake River sockeye is anticipated. None to very few of these stocks should be occupying or utilizing the reservoir habitats during the proposed in-water work periods. Potential exists for adverse effects in limited Incidental Take of potentially a few Snake River spring/summer or fall chinook salmon; Snake River, Upper, or Middle Columbia River Steelhead; and/or Upper Columbia River Spring Chinook Salmon. An unknown number of overwintering juveniles of these stocks could be occupying or utilizing the lower Snake River and McNary reservoir habitats during the in-water work windows and a few adult steelhead may be in the vicinity of some dredging activities. In addition, dredging in off-channel areas such as boat basins and irrigation intakes when temperatures exceed 70 °F (21.1 °C), typically considered a thermal barrier to salmonids, is not expected to have impacts to listed species.

6.0 RECOMMENDED CONSERVATION MEASURES

6.1 Mitigation Measures

Mitigation measures should avoid, minimize, rectify, reduce, or compensate for "significant" environmental effects (40 CFR 1508.20). In addition, whenever it is feasible, mitigation measures need to be considered for impacts that are not, of themselves, considered to be significant. As such, wherever possible, mitigation measures have been formulated to address adverse environmental effects.

A prominent mitigation measure that is relevant to the alternatives relying primarily on in-water disposal of dredged material is the creation of shallow-water and mid-depth habitat with the dredged material. Implementation of this mitigation measure would compensate for effects of dredging and disposal activities on aquatic resources and, in particular, endangered salmonid species. The Corps would conduct long-term physical monitoring of shallow water and mid-depth disposal sites to evaluate the success and quality of habitat creation.

Disposal of dredged material is designed for beneficial use. Silt/sand mixes will be placed beginning at the Knoxway Canyon bay site (RM 116) as a base for a +10-foot-deep (3.0-meter-deep) capping of 80+ percent sand. Cobbles and larger gravels removed from the navigation lock approaches will be placed at the Joso site until the cobbles are needed for beneficial use, such as armoring against wave action along the riverward slope of newly created shallow water habitats. The proposed placement of dredged material will act to mitigate for lost shoreline and shallow bar rearing habitat used by juvenile Snake River fall chinook salmon and should result in long-term benefits to anadromous fish production and survival within the lower Snake River migration corridor.

Natural shallow sloping shoreline beaches represent preferred shallow water habitat for fall chinook. Criteria would include a slope of 3 to 5 percent from near the water's edge down to 20 feet (6.1 m) at the deepest edge within the river channel. Substrate surface should be

predominately open sand that is relatively smooth throughout its distribution without the hummocking resulting from simple split-bottom barge load dumping. This will require smoothing by dragging a beam subsurface from a small to medium size tug, thus establishing that 3 to 5 percent slope from the near shore edge riverward. This barge dumping/smoothing sequencing would need to be done in phases working riverward from near the water's edge to the maximum 20-foot (6.1-m) depth.

6.2 In-Water Work

Most work will be completed within the established in-water work window of December 15 through March 1 on the lower Snake River and from December 1 to March 31 on the Columbia River. Pre-dredging work at the Joso barge slip site would need to be done in November 2002. In off-channel areas of the Snake River, primarily irrigation intakes and possibly boat basins, dredging may occur on a case-by-case basis in late July through September when water temperatures exceed 70 °F (21.1 °C).

6.3 Surveying

Prior to dredging, the lock approaches of all lower Snake River dams will be surveyed for redds according to established protocol (Dauble et al., 1995) to determine if modifications to velocity and substrate could cause salmon to avoid these areas for spawning. If redds are found and verified, then location and duration of dredging will be modified to accommodate avoidance and protection of any verified redds.

6.4 Monitoring Plan

The Corps prepares a water quality monitoring plan for each dredging and disposal activity. The Corps would require the contractor to take water samples and measure turbidity using a nephalometer twice per day during active dredging. The contractor would take samples 1 hour after dredging began and 1 hour before dredging ended each day. Samples would be taken 300 feet (91.4 m) upstream from the dredging operation and 300 feet (91.4 m) directly downstream from the point of dredging. The contractor would take two measurements at each location: 3.3 feet (1 m) below the water surface and 3.3 feet (1 m) above the river bottom. The contractor would be required to notify the Corps within 8 hours in the event that the turbidity levels of the dredging operation exceeded allowable levels. These levels are defined as 5 NTU's over background when background is 50 NTU's or less, or more than a 10 percent increase in turbidity when the background is more than 50 NTU's. Background is measured 300 feet (91.4 m) upstream of the dredging operation. Immediately upon determining any exceedence of this NTU limit, the contractor would alter the dredging operation in an attempt to decrease turbidity levels. Monitoring would continue at the downstream location to determine if the NTU levels either returned to an acceptable limit or failed to be reduced. If the NTU levels did not return to an acceptable limit within a time period defined by the Washington Department of Ecology, the contractor would stop dredging and wait for the NTU levels to drop below exceedence levels before resuming dredging under an additionally altered scenario. If the contractor were unable to alter the dredging operation to meet turbidity requirements, the Corps would be contacted for further instructions.

The Corps would also conduct monitoring using self-contained water quality recording devices (e.g., YSI Sondes®) to take hourly readings of turbidity, dissolved oxygen, pH, ammonia, and conductivity. The recording devices would be stationed 300 feet (91.4 m) upstream of the dredging operation, 300 feet (91.4 m) downstream of the dredge, upstream of the in-water disposal areas, 300 feet (91.4 m) downstream of the two shallow/mid-depth disposal sites (one device at each site), and 300 feet (91.4 m) downstream of the deep-water site. The Corps would download the recorded information daily and analyze the data to ensure water quality standards were being met.

In addition, biological monitoring of the disposal site and newly created shallow water habitat will be conducted to document the long- and short-term benefits to anadromous salmonids by the creation of this habitat. Monitoring of the created habitat may include studies similar to those conducted by Dr. Bennett to determine use of these areas by invertebrates, resident fish, and anadromous fish.

6.5 Substrate Quality

A concern with the quality of the substrate removed from boat basins is the potential for the accumulation of bound contaminants in the silt. These often occur as a result of spilled gasoline and oils used to operate watercraft or are brought downriver to settle in the lower velocities of the backwater eddy environments. Recent sampling in these basins during June-July 2000 by the Corps and routinely by others for the private marina operators indicate that concentrations of contaminant indicators are below the level that would preclude their disposal in water. If dredged material has contaminants that exceed limits defined by water quality standards for in-water fill, but do not reach regulatory action levels requiring hazardous waste classification, it will be placed at the Joso contingency upland disposal site. In the event that dredged material has levels of contaminants above regulatory action levels or if a pocket of visually contaminated sediments is hauled up in the clamshell or bucket, the Corps would direct that such an area be classified and investigated as Hazardous Waste and deposited in a truck for removal to an appropriate established waste disposal site, likely a landfill. Upon visual inspection of wet sediment, the presence of organic fuel products is readily apparent due to the multi-colored shine, smell, or oily feel of such material. This was observed near and in dewatering boat basins stranded during the 1992 reservoir drawdown test of Lower Granite and Little Goose reservoirs.

7.0 CONCLUSIONS AND DETERMINATION OF EFFECT

Formal consultation with the NMFS under Section 7 of the ESA for these proposed activities is requested. Based on the above information, it is determined that the above described actions *"May Affect, But Are Not Likely To Adversely Affect"* individuals of Snake River sockeye; and *"May Affect, And Are Likely To Adversely Affect"* Snake River spring/summer and fall chinook salmon, Upper Columbia River spring chinook, Upper and Middle Columbia River Basin steelhead and/or Snake River Basin steelhead ESUs, or act to jeopardize their continued existence, or act to preclude their survival or recovery through potential adverse modification of rearing and migration components of their Critical Habitat. This determination is based on all work being performed either within the designated winter in-water work windows, on a one-time basis in November at the Joso site in 2002, or in off-channel areas of the Snake River when

water temperatures exceed 70 °F (21.1 °C). The dredged material removal and disposal activities and their byproducts, such as short-term turbidity plumes, should be easily avoidable by either juvenile or adults of any listed salmonid stock that would be rearing or migrating within the main stem Snake or Columbia Rivers. The dredging activities by non-hydraulic techniques should be harmless and the limited use of non-agitation suction hydraulic techniques with fish exclusion techniques should also be harmless. We also believe that the in-water disposal activity of adding dredged material to increase the area of the mid-elevation benches of the lower Snake River reservoirs would not adversely affect Critical Habitat for the listed stocks of Snake River chinook and sockeye salmon or Snake River steelhead, and should be beneficial to Snake River fall chinook salmon juvenile rearing through increasing available, suitable, and functional habitat in open sand with increased macroinvertebrate production. Some white sturgeon habitat could be effectively displaced by conversion to shallow water habitat more suitable for fall chinook salmon rearing.

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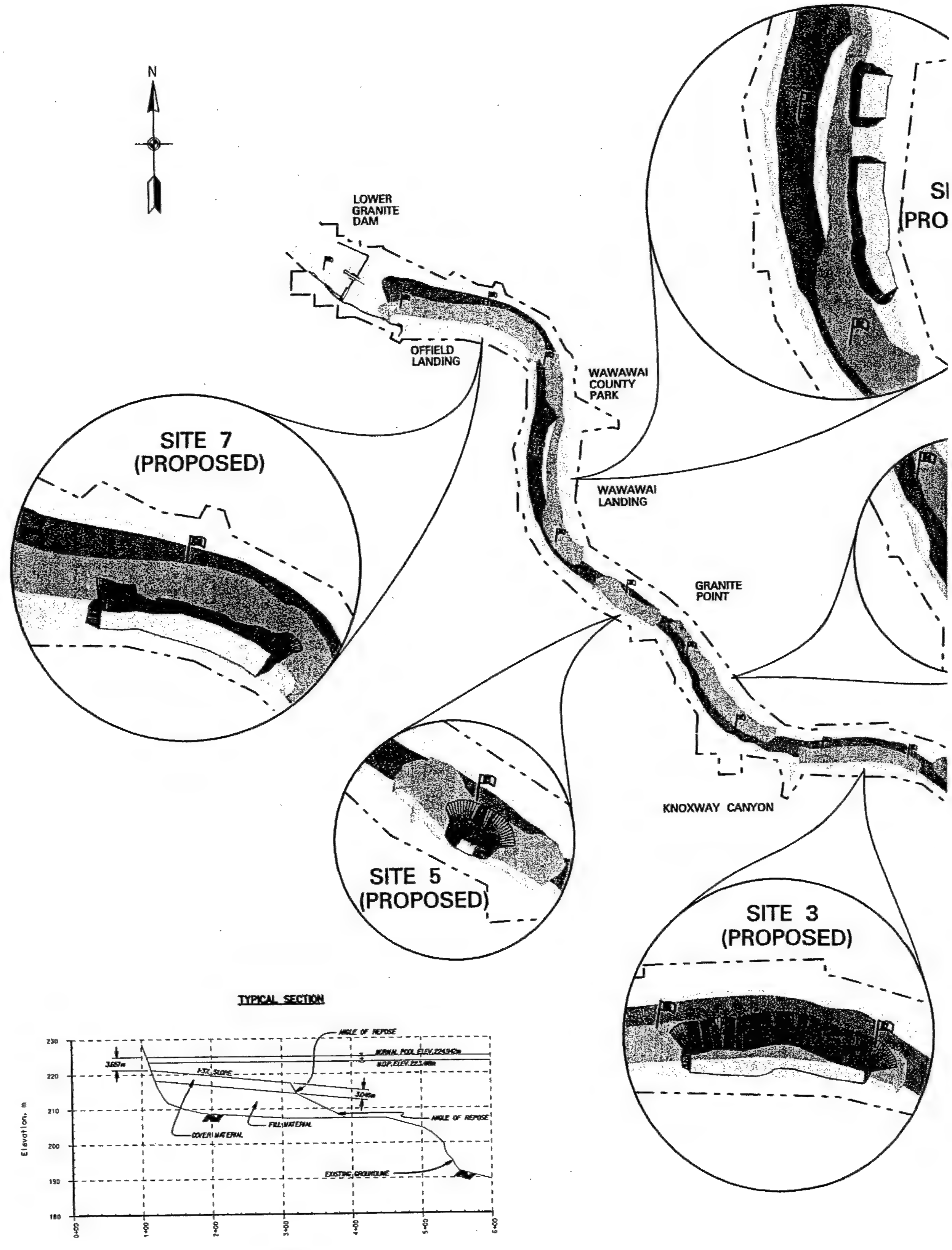

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GIS Conversion: George Hardin CENWW-PD-EC

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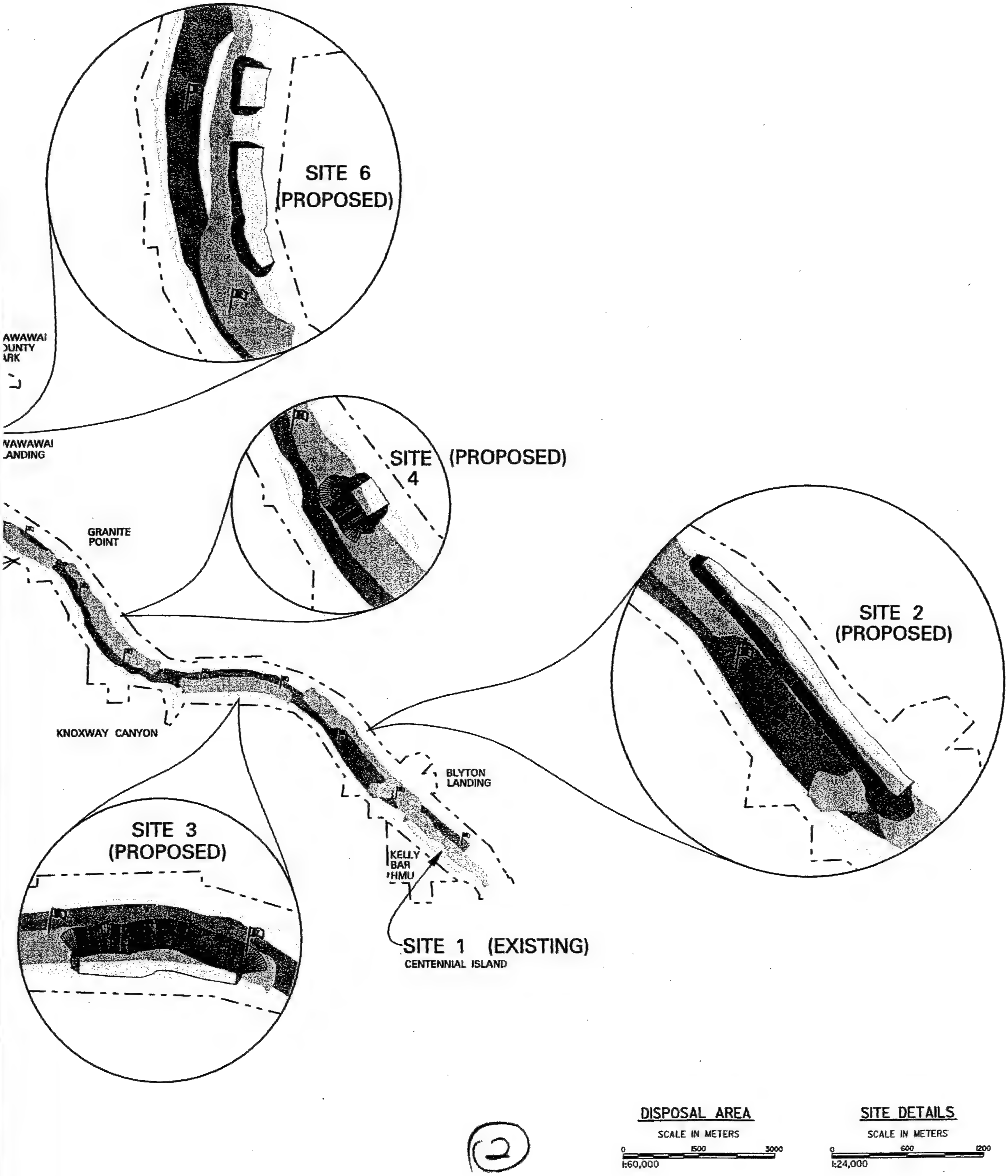

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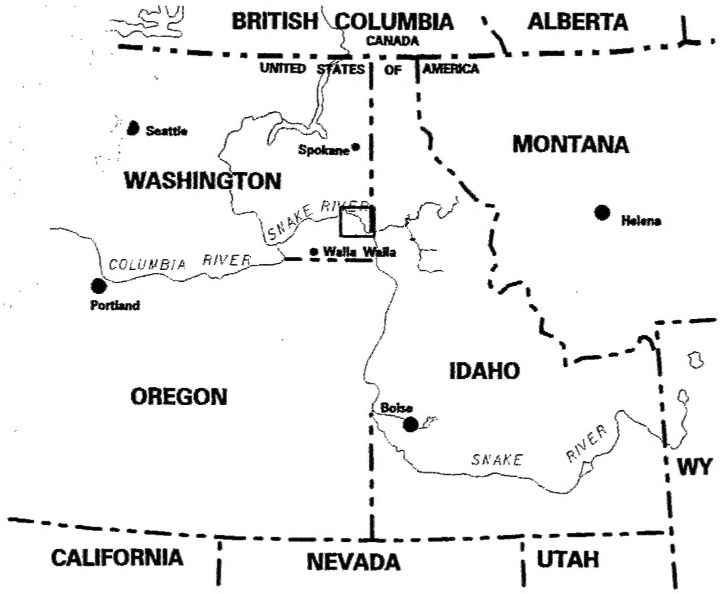

Conservation Pool

USACE Project Boundary

Shallow In–Water Disposal
Water Surface to 20 ft Below

Mid–Depth In–Water Disposal
20 ft Below Water Surface to 60 ft Below

Deep In–Water Disposal
60 ft Below Water Surface to Bottom of Reservoir

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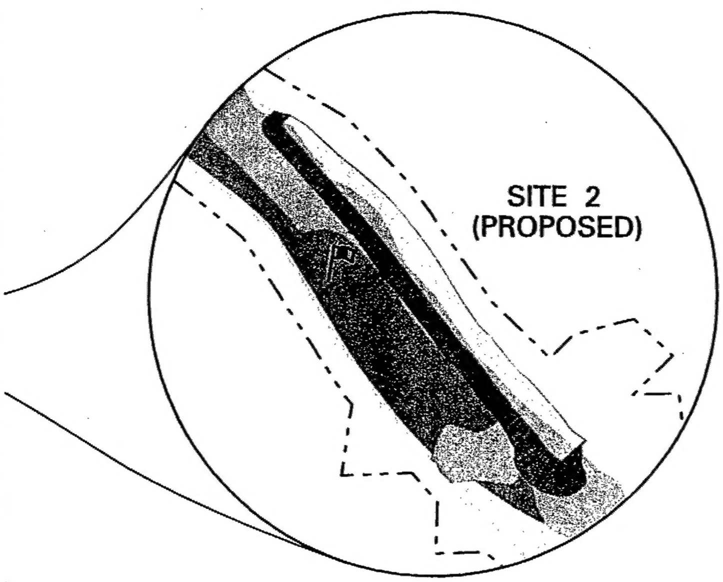

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GEOGRAPHIC
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Walla Walla District

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Walla Walla District

Dredged Material Management and Environmental Impact Statement

Lower Granite Reservoir

IN–WATER DISPOSAL AREAS

DISPOSAL AREA
SCALE IN METERS
0 1500 3000
1:60,000

SITE DETAILS
SCALE IN METERS
0 600 1200
1:24,000

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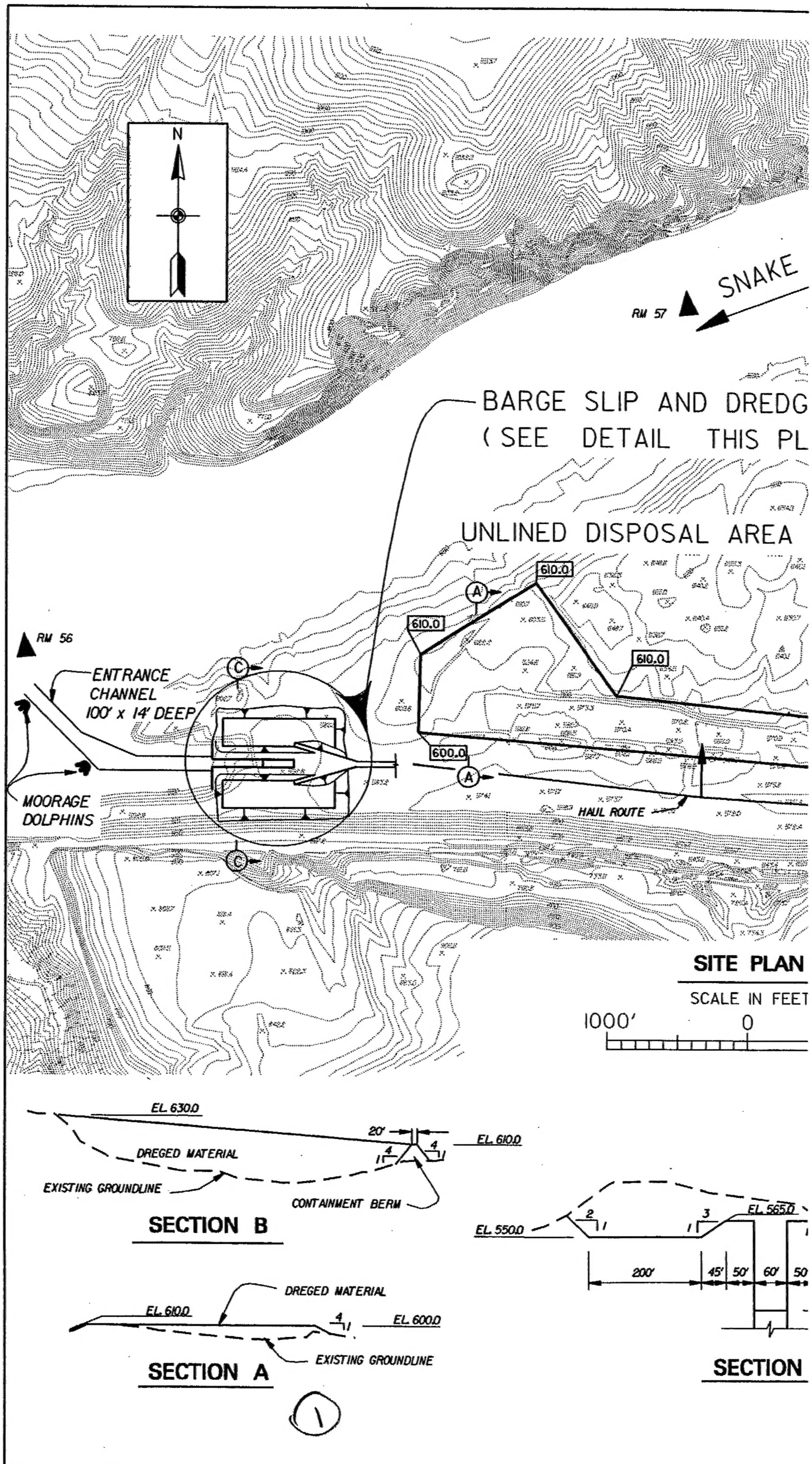

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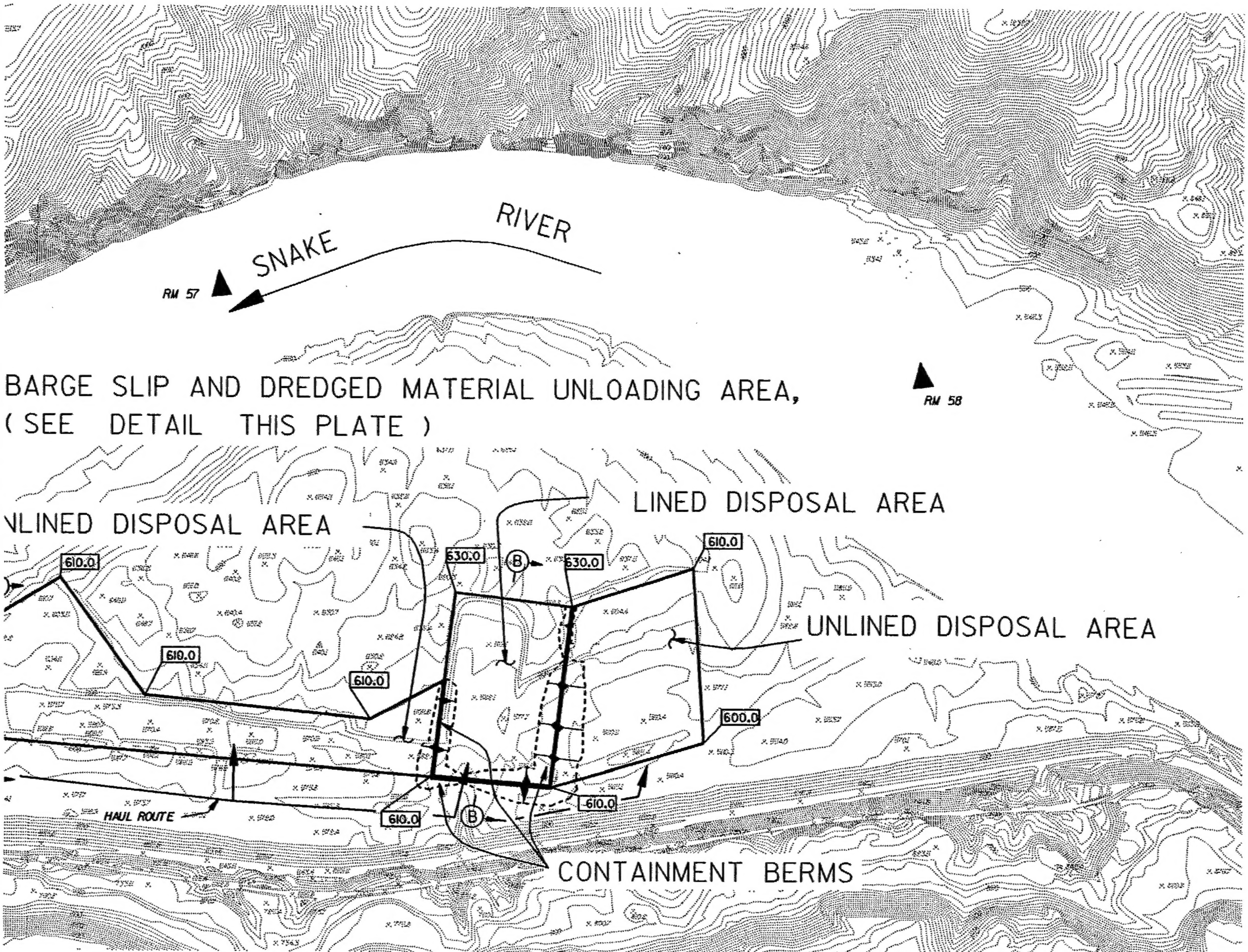
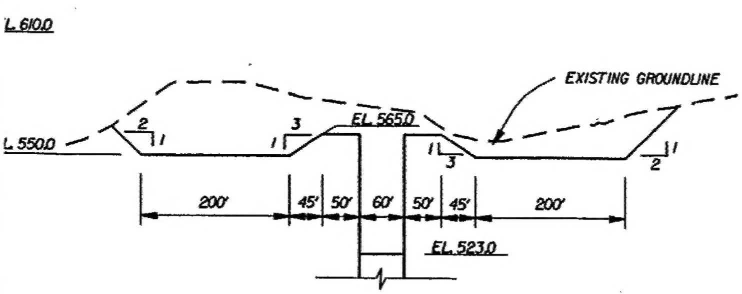


SITE PLAN

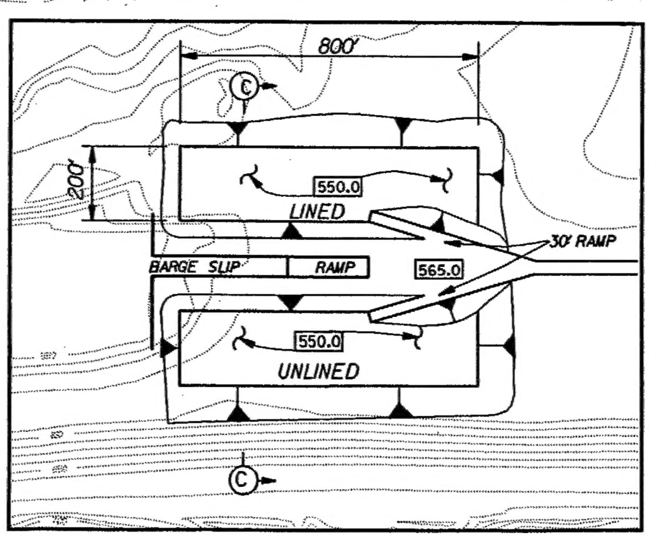
SCALE IN FEET

1000′ 0 1000′



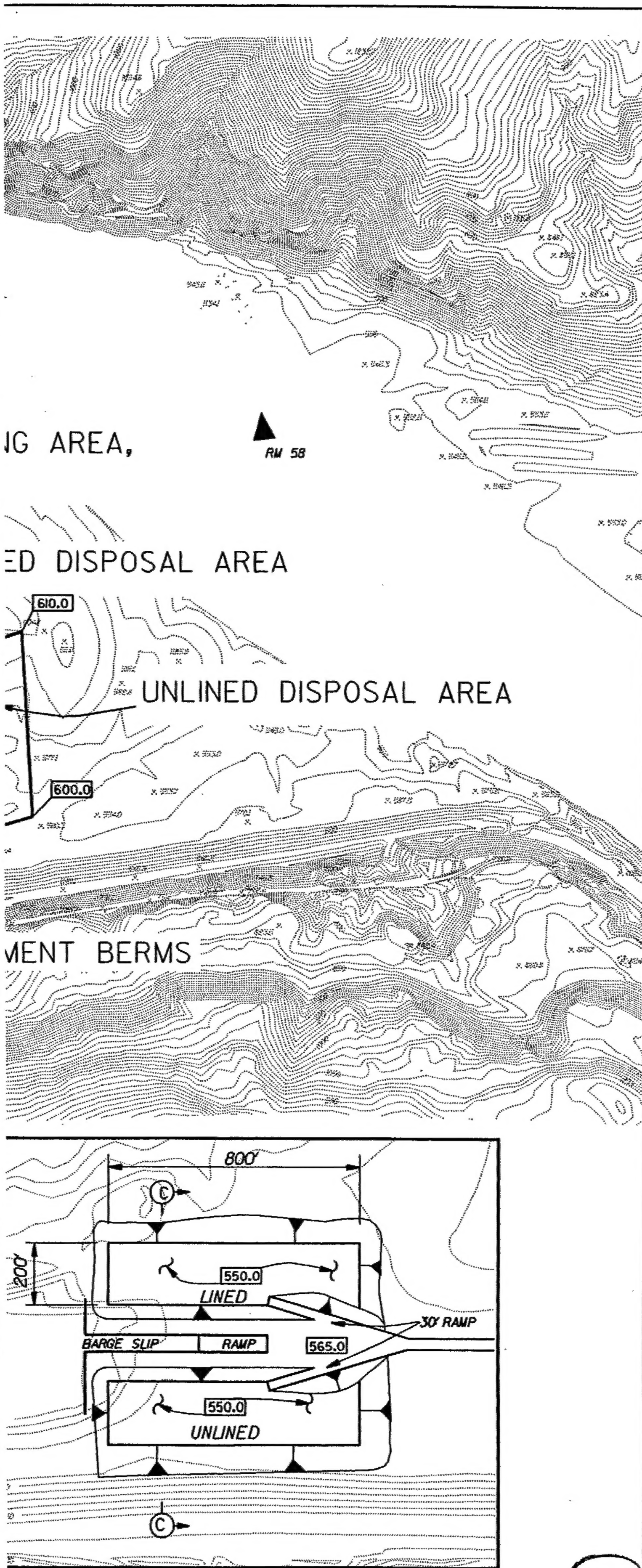
SECTION C

(2)



DETAIL – DISPOSAL UNLOADING AREA

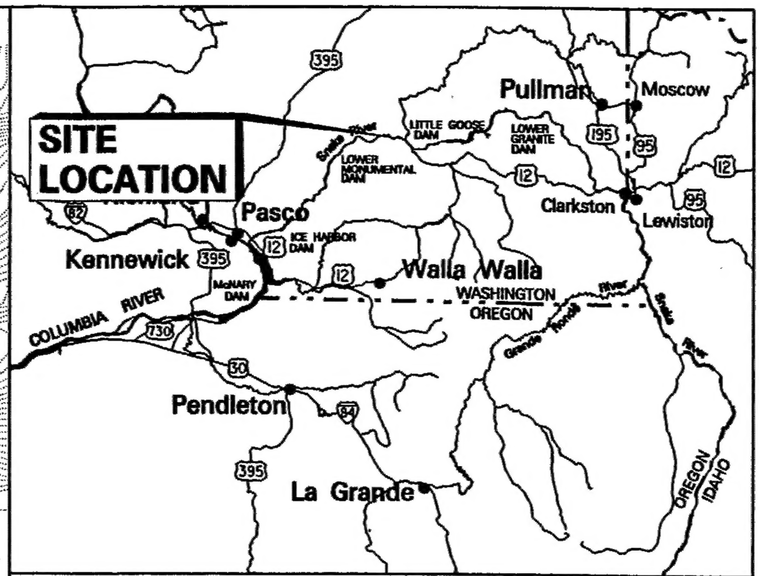
SCALE – 1" = 500′



DETAIL – DISPOSAL UNLOADING AREA

SCALE - 1" = 500'

3



GEOGRAPHIC INFORMATION SYSTEMS
Corps of Engineers
Walla Walla District

DRAFT

Walla Walla District

Dredged Material Management Plan and Environmental Impact Statement

Lower Monumental Reservoir

JOSO CONTINGENCY UPLAND DISPOSAL

CONCEPTUAL SITE PLAN

2001

PLATE F – 2